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# Kew. ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

## 1923.

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ERRATA.

Page 128, footnote, *for* Part IV *read* Part V.
Page 189, line 4 from bottom, *for* varieties *read* rarities.
Page 225, No. 544b, for **Brachymecium** read **Brachymenium.**
Page 247, line 14 from top, *for* 225 *read* 255.

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

No. 1] [1923

## I.—THE BRITISH SPECIES OF CYTOSPORA.

W. B. Grove.

If one finds in a dead or dying branch a number of little dark-coloured pustules, each about half a millimetre or so broad, which at first raise the surface in a conical or convex cushion and at length burst it at the summit, protruding a little roundish disc, of any colour from pure white to dingy-brown, in the midst of which is a black point, and if in moist weather there exudes from the black point a whitish, yellowish, or reddish tendril of spores—the inference is that there lies before one a fungus of the form-genus *Cytospora*.

The members of this genus of the Coelomycetes have spores very similar to those of *Naemospora*, but can be distinguished from them by the possession of an obvious pycnidial wall (seen on cutting a section), usually of a dark-grey or olive-brown colour, whereas *Naemospora* has no pycnidial wall, merely a basal proliferous stratum, and is generally of a lively yellowish or reddish colour. There is another genus, *Libertella*, similar to *Naemospora*, but having falcate and longer spores, over 10 $\mu$. If one overlooks these distinctions, it is easy to go astray, for the tendril alone is no mark of a *Cytospora* or a *Naemospora*.

For example, there is a fungus recorded under the name "*Naemospora crocea* Pers." as having been found on coniferous trunks at Alnwick, during the 1907 foray of the British Mycological Society. But, though yellow tendrils are abundant, the specimen on sectioning is seen to have thick dark enclosing walls to all of its many chambers. It is really *Cytospora Kunzei* Sacc. Other similar instances abound in mycological literature.

The pycnidial chambers, or chamber, of *Cytospora* always arise in a stroma (sometimes, however, nearly obsolete), composed of a more or less grumous mass of mycelial cells. Each chamber is lined on every side by a crowded stratum of spore-pedicels, sometimes branched, which bear the spores singly at

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their apices. These spores are, in probably every species, of a characteristic shape, called "sausage-shaped," viz. cylindrical, slightly curved, with more or less rounded ends. This shape is also met with not only in the spores of *Naemospora*, but in the ascospores of *Valsa* and the allied Pyrenomycetes.

*Cytospora* was originally defined by Ehrenberg in Sylv. Berol. p. 28 (1818), as follows :—

"Sporangium membranaceum aut grumosum ostiolo inструctum, includens massam sporuloso-gelatinosam demum (sæpe cirrorum aut globulorum forma) erumpentem."

The stroma, varying from 0·25 to 2 mm. in diameter, is covered by the epidermis or periderm which it usually raises convexly; sooner or later it becomes erumpent, conical or pustular, enclosing one or more chambers (pycnidia), which are often imperfectly separated and irregular or sinuous in shape (loculi), but are sometimes distinct, more or less circinating and occasionally arranged round a central chamber or a black columella. When the stroma is exposed by the bursting of the covering layer, a disc is seen in which there are one or more black pores; occasionally the stroma contains only one loculus, but if there are several they may still open by a common central pore, or by separate apertures. The spores are always small (varying from 3 to 10 $\mu$ in length), often very numerous,* nearly or quite hyaline, and in a damp atmosphere they issue from the pore in a slender curling tendril,† which may be caused by greater moisture to coalesce into a globule or to sink into a formless mass. As the tendril collapses, the colour of the spore-mass always gets deeper in tint. The colour mentioned in the descriptions is that of the freshly exuded tendril. Whether the spore-mass assumes the shape of a globule or a tendril, depends upon the moisture of the atmosphere rather than upon the nature of the fungus.

The spores are frequently described as "straight or curved," but this is nearly always an illusion due to the different postures in which they are seen. If a single spore, of the ordinary sausage shape, is watched while moving in water under a microscope, it may be seen to pass through three phases, as it presents itself in the three planes of space : like many Diatoms and Desmids, it has a (curved) profile-view, a (straight) face-view, and a (circular) end-view. The same statement is true of the spores of many *Dasyscyphae* and other small Pezizeae, and the same mistake is often made in the description of them.

The members of the form-genus *Cytospora* are probably all pycnidial stages (or "spermogones") of those Pyrenomycetes which have sausage-shaped spores, such as *Valsa*, *Valsella*, and

---

* Rostrup reckoned the number of spores in a single pustule of *Cytospora Pini* to be over 400 millions, and this is no exaggerated estimate.

† If the material is in good condition and not too old, but without tendrils, the spores can be caused to exude by placing the lower end of the stick in tepid water, or by merely putting a drop of water on the bark.

*Eutypella*.* They are so similar that some of them (in the absence of the ascophorous stage) can scarcely be distinguished from one another, unless it be by the colour of the tendril, especially when they are said to occur on hosts belonging to several different genera. Many, but not all, of these latter allegations no doubt refer to collective species (biologically, at least, distinct), but some of them are merely inherited from the past and are the result of confused identification or desultory examination. Occasionally the perfect (ascophorous) stage may be found, if looked for, in close company with the pycnidial stage, in which case there may be no uncertainty. When both occur, it sometimes happens that the *Cytospora*-stage has been parasitic, and is succeeded by the mature ascophorous stage on the dead host. The two forms of fruit are more rarely produced simultaneously, though of course their periods may overlap.

When more is known about them (but the time is not yet), the species may perhaps be separated into two sections, following von Höhnel in Annal. Mycol. 1918, p. 130 :—

(i) *Eucytospora* (belonging to *Valsa* proper, *Euvalsa* Nits.), not possessing a special basal stroma, so that the pycnidial chambers are merely immersed in the little changed matrix; *e.g. C. Abietis, C. ambiens, C. Capreae, C. ceratophora, C. chrysosperma, C. Curreyi, C. germanica, C. leucosperma, C. Pini, C. pruinosa, C. Rosarum, C. Salicis.*

(ii) *Leucocytospora* (belonging to *Leucostoma, Eutypella* and *Valsella*), provided when mature with a special basal stroma, which usually shows as a dark line underlying and surrounding the loculi, and delimiting the part occupied by the stromatic mass from the other more or less unchanged matrix; *e.g. C. cincta, C. Kunzei, C. guttifera, C. leucostoma, C. nivea, C. Prunorum, C. rubescens.* When this basal stroma is well-marked and closely adherent, it forms what Fries called the "conceptacle," but not infrequently it is at some distance from the loculi; moreover this possession of a "conceptacle" seems to be dependent, to a certain extent, upon the circumstances of growth, and cannot always be trusted as a guide.

In examining a Cytospora, in order to decide this and other points, sections should be cut (preferably, as Diedicke recommends, but not necessarily, with a dry razor) both vertically and horizontally at different levels. For the latter purpose the pustules may be best cut *in situ*. It must be remembered that, unless one can find the *Valsa* and the *Cytospora* growing in intimate association as in *C. germanica*, or can cultivate the one from the other, the naming of some of the Cytosporas may still involve an element of doubt. Since the fungi belonging to this group cause a considerable amount of disease, especially in fruit trees, and do so chiefly, if not entirely, in their pycnidial stage, the

* It will be seen that, of the species recorded below, exactly one-half have an ascophorous stage assigned to them, though in several cases with considerable doubt; for the other half, there is as yet no clue.

difficulty of naming would be a serious disadvantage, if it were not that the same remedies can be applied in nearly every case. There is great room for experiment in the artificial culture of these economically important fungi by those who have time and facilities placed at their disposal in the phytopathological institutions now so numerous, and it is strange that (with two or three exceptions) so little work has been done in this direction by professional mycologists. Still, when the host is known, there are certain characteristics of most of the species which will lead to a probable conclusion, and this may be converted into certainty by discovering the *Valsa*-stage.

In conclusion, perhaps it will be permissible to recount two experiences among my own which will illustrate what sort of evidence can be obtained without test-tubes or pure cultures. When one says that the *Cytospora* and the *Valsa* occur together, that in itself goes for little, or is at best only suggestive, as every one would admit; it is the way in which they occur together that is convincing.

First example :—In the summer and autumn of the year 1918, the fungus which is described below as *C. Oxyacanthae* was extremely common round Birmingham on hawthorn cuttings left lying in ditches and on the hawthorn stakes driven into the ground by the hedgers to support the pleached hedges. Mr. D. A. Boyd reported to me exactly the same state of things in the south-west of Scotland. By continuing to look in suitable places, at last, in March and April, 1919, I came across a number of branches which yielded ascospores dispersed among the still remaining *Cytospora* pustules, and when once seen they could be found elsewhere in similar positions and in great quantity. It was a disappointment that the ascophorous stage turned out to be hardly distinguishable from normal *Valsa ambiens*, and could at most be considered only one of the forms into which that collective species will have to be subdivided. But of the genetic connection between the two stages no one who had observed the facts could have had the slightest doubt. One could constantly find the *Cytospora* pustule surrounded by a ring of perithecia whose mouths bordered the disc.

Second example :—In a large park, which need not be further particularised, numbers of poplar trees of various species were thickly covered, especially on the smaller branches, with the orange-yellow tendrils of *Cytospora chrysosperma*. Many of the trees (some young) were obviously dying, and one of them (about twenty feet high), which was most severely attacked, was already nearly dead. When the top of this was lopped off, it was found that the main stem, a little over one inch in diameter, was completely occupied for about four feet by a crowd of *Valsa* pustules. These on examination were seen to be *Valsa sordida*, the branches of the lopped portion and the upper part of it being as thickly covered by the *Cytospora*. If the top part of the tree had not been lopped off, the *Valsa*-stage might easily have escaped observation. Here, again, there could be no faintest doubt of

the connection of the two stages in the mind of any one who saw the tree : the proof was as conclusive to the observer as any that could be given by artificial cultures, and even more so than some.

## Alphabetical List of Species.

**C. Abietis** *Sacc.* Syll. iii. 269. Allesch. vi. 573. Diedicke, Pilz. Brand. p. 329. *C. Pini* Fckl. p.p.

Stromata 500–750 $\mu$ diam., convex, with a thick round truncate neck, disclosing a grey or yellowish disc, which afterwards becomes brownish-black and is pierced by a single flat open pore (rarely two), multilocular within, the loculi very minute and densely crowded without order. Spores* 5–6 × 1 $\mu$ (3–4 × 1 $\mu$, Sacc.), issuing in dingy yellow masses; sporophores subulate, 12–16 $\mu$ long, verticillately branched (sparingly branched, Sacc.)

On small branches of *Larix europaea*. Eastham Wood, Cheshire (Ellis). Dec. Said to be the pycnidial stage of *Valsa Abietis* Nits; in other countries it is recorded also on *Picea* (*Abies*) *excelsa*, and on *Sequoia*.

*Distrib.* Europe generally.

**C. Ailanthi** *Berk. & Curt.* North Amer. Fungi. no. 3432; Grevill. ii. 99. Sacc. Syll. iii. 277.

Stromata rather crowded, 250–300 $\mu$ diam., totally immersed, then bursting the epidermis by a minute pore and disclosing a blackish disc, but scarcely prominent. Spores 5–6 × 1 $\mu$.

On twigs of *Ailanthus glandulosa*. Kew Gardens (Cooke). Apr.

The specimens are young and somewhat doubtful. Not the spermogone of *Eutypella Ailanthi* Sacc., for that is said to be *Cytosporina Ailanthi* Sacc., with spores 15 $\mu$ long.

*Distrib.* United States of America.

**C. ambiens** *Sacc.* Syll. iii. 268. Allesch. vi. 567. Died. p. 332.

Stromata subgregarious or densely scattered, 0·5–1 mm. diam., conico-depressed, often extending along a whole branch, covered, then erumpent, blackish-grey, with a roundish flat disc which is paler or brownish, but never white except at first; ostiole black, usually one only, scarcely protruding; loculi several, but often confluent into one, the walls composed of dark brownish tissue. Spores 5–7 × 1 $\mu$, exuding in a white, then yellowish mass; sporophores often much branched, 20–30 $\mu$ long, branches forked or verticillate, acicular.

On bark of twigs and branches of *Acer*, *Betula*, *Castanea*, *Corylus*, *Cotoneaster*, *Fagus*, *Fraxinus*, *Pyrus*, *Rosa*, *Rubus*, *Quercus*, *Ulmus*, etc. Oct.–May. Very common, but no doubt

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* In the descriptions which follow, the spores are always to be taken as sausage-shaped, unless some other term is applied to them. All the species recorded have been examined, except where "(*n.v.*)" is added, but in several cases the specimens were too poor or too scanty to permit of certainty.

a collective species; the pycnidial stage of *Valsa ambiens* Sacc., which constantly occurs with it, and which is also a collective species varying much on the different substrata.

Recorded abroad also on *Alnus*, *Carpinus*, *Cornus*, *Populus*, etc. The prominent disc is almost always round, and varies in colour from white through grey to black; the spores are very variable, from 4 to 7 $\mu$ in length, with sporophores from 10 up to 30 $\mu$.

The fungus gets its name from the fact that the numerous black ostioles of the perithecia of the *Valsa* stage are often arranged *in the form of a ring* (*i.e.* circum-ambient) just within the periphery of the disc. The form on *Betula* may belong to *Valsa betulina* Nits. and besides that other forms on *Crataegus*, *Rubus*, *Tilia*, etc., may be distinguished: see *C. Oxyacanthae*, *C. carphosperma*, and *C. leucosperma*, all of which have been included by various authors under *C. ambiens*. The chief mark of the collective species seems to be the at length dingy disc, the much branched sporophores, and the colour of the tendrils. The latter is white at first, not pure white, but opaline white, the white of "London" milk or of opal gas-globes, changing sooner or later to a yellow of varying intensity; but there seems always to reside in the yellow a turbidity which gives it a peculiar character, perhaps that implied by Lind when he calls the tendrils of *C. ambiens* on *Fraxinus* "olivaceous."

*Distrib.* Europe, North and South America.

**C. Ampelopsidis** *C. Massal.* Contr. Mic. Ver. p. 86, pl. 2, f. 12. Sacc. Syll. x. 243. Allesch. vi. 569.

Stromata scattered, somewhat oval, longitudinally placed, flattened-convex, black, 400–600 $\mu$ long, nestling in the cortex and for a long time entirely concealed by it, at length disclosing an oval blackish disc, marked with several minute non-projecting pores, multilocellate within, the loculi small and varying much in shape and arrangement, separated by thick dark brown walls. Spores 5–6 $\times$ 1–1·5 $\mu$, in mass nearly (but not quite) colourless; sporophores crowded, parallel, rod-shaped, usually very erect and straight, 15–18 $\times$ 1 $\mu$.

On twigs of *Ampelopsis hederacea*. Kirkby, Lancs. (Ellis). June. Distinguished from *C. Vitis* Mont. by being all but completely concealed by the outer tissues. Massalongo says that the tendrils are "pinkish when moist, reddish-amber when dry."

*Distrib.* Germany, Italy.

**C. annulata** *Ell. & Ev.* in Proc. Acad. Nat. Sci. Philad. 1893, p. 160. Sacc. Syll. xi. 508.

Stromata immersed, multilocular, about 1 mm. diam. slate colour within, with a ringed ostiole. Spores 5–6 $\times$ 1–1·25 $\mu$, "oblong."

On dead branches of *Acer Negundo*, Kew Gardens (Cooke).

When perfectly developed, as seen in American specimens, this presents a remarkably ringed appearance. The black

shining ostiole is surrounded by a narrow ring of whitish stroma; around this is the conspicuous torn margin of the epidermis, and in many cases the whole is surrounded by a wide zone in the form of a dark-brown stain.

*Distrib.* North America.

**C. Aquifolii** *Fr.* in Duby, Bot. Gall. ii. 725. Sacc. Syll. iii. 274. Allesch. vi. 583.

Stromata subgregarious, conical, up to 500 $\mu$ diam., black, surrounded by a black stain, covered, then erumpent by a rimose or stellate fissure and disclosing a small very dark-coloured disc, with a central prominent very black pore which often nearly obliterates the disc, plurilocular within; the loculi small, roundish, and clustered in a circular group; no conceptacle; walls of loculi very thick and blackish-brown. Spores 4–6 $\times$ 1 $\mu$; sporophores simple, subulate, about three times as long as the spore, tinged olivaceous at the base.

On dead branches and twigs of *Ilex Aquifolium.* Kew Gardens; Harborne & Quinton, near Birmingham. Mar., Apr.

These specimens differ from *C. ilicina* Sacc. (*ibid.*, p. 274), the spermogone of *Valsa Aquifolii* Nits., in the total absence of a conceptacle (*cf.* Nitschke, Pyr. Germ., p. 231), as well as in the smaller spores. The bases of the pycnidia are simply embedded in the cortex. The centre of the pustule, before it bursts, is marked with a whitish dot (from the loosened epidermis) and afterwards the disc is surrounded by the pale upturned edge and the black zone, so that it often presents a distinctly annulated appearance that reminds one of *C. annulata.*

*Distrib.* France, Germany.

**C. atra** *Sacc.* Syll. iii. 257. Allesch. vi. 586. Died. p. 348. *Lamyella atra* Bon. Abhandl. ii. 134, pl. 2, f. 15.

"Stromata small, covered, then erumpent, black without, pallid within, distinctly plurilocular, the chambers ending in a rather prominent dark-coloured disc, and each provided with a separate roundish pore. Spores cylindric-oblong, sausage-shaped, very minute; sporophores rather long, branched."

On dry branches of *Morus alba.* Kew Gardens (Cooke). Distinguished chiefly by its separate ostioles. (*n.v.*)

*Distrib.* Germany, Denmark, India.

**C. Capreae** *Fckl.* Symb. Myc. p. 199 (1869). Sacc. Syll. iii. 262. Allesch. vi. 605. Died. p. 361. *C. Schweinitzii* Sacc. Syll. iii. 261 (1884). Allesch. vi. 602.

Stromata gregarious, conico-truncate on a rounded base, 500–750 $\mu$ diam., somewhat prominent, erumpent through the periderm and surrounded by its torn edge, or (if the easily loosened periderm is thrown off) standing free on the brownish surface of the inner bark (cortex), attenuated into a thick neck which is pierced by a rather broad pore, usually one-chambered or with several spurious

loculi which are rather large and radiately disposed, filled with a greyish mass; no conceptacle. Spores 4–5 × 1 $\mu$, issuing as an olivaceous amber-coloured tendril; sporophores simple or branched at the base, 20–28 × 1 $\mu$.

On bark of *Salix Caprea*, *S. fragilis*, *S. petiolaris*, etc., Kew Gardens. The pycnidial stage of *Valsa Schweinitzii* Nits. Saccardo appears to have conferred his specific name on it in oversight of Fuckel's prior name.

*Distrib.* Germany, Austria, Italy, Algeria.

**C. carbonacea** *Fr.* Syst. Myc. ii. 544. Sacc. Syll. iii. 260. Allesch. vi. 610. Died. p. 366.

Stroma proper rather thin; loculi black and becoming indistinct together with the whitish disc; ostioles prominent, black.

On branches of *Celtis occidentalis*. Kew Gardens (Cooke). The specimens are somewhat doubtful, and imperfect, but they are not *C. Celtidis* Ell. & Ev.

"A species of which little is known, though it is very common; provided with a proper conceptacle; pustules minute, not prominent, immersed in the inner bark; stroma proper carbonaceous, indistinctly divided into chambers, but there is a very distinct central columella." (Fr., on *Ulmus*.)

Diedicke, who finds it on Elm in Germany, describes it as follows:—"Stromata loosely gregarious, raising the epidermis at length considerably, and bursting it with the whitish disc, flatly conical, up to 1·5 mm. broad, of dark olivaceous texture; many incomplete radiating chambers arranged round a central columella with a common ostiole. Spores 4–5 × 1·5 $\mu$; sporophores simple, filiform, up to 15 × 1 $\mu$, soon vanishing."

*Distrib.* Belgium, Holland, Germany, Sweden, North America. Recorded also on *Alnus*.

**C. carphosperma** *Fr.* Syst. Myc. ii. 543. Cooke, Handb. pp. 462, 826. Sacc. Syll. iii. 274. Allesch. vi. 588. Died. p. 351.

Pustules gregarious, depressed-conical, 0·5–1 mm. broad, stroma often little and indistinct; loculi circinating, black; disc round, of a dingy whitish colour, with usually a single central black ostiole (but sometimes two). Spores 5–6·5 × 1–1·5 $\mu$, issuing in a pale-yellow, then deeper yellow tendril; sporophores simple or verticillately branched, acicular, 15–20 × 1·5 $\mu$

On bark of species of *Tilia*. England, Scotland, Ireland; not uncommon. Winter and spring. The pycnidial stage of an undetermined species of *Valsa*.

The freshly exuded spore-mass has the colour of dry wheat straw, κάρφος; that is the only mark apparently that will distinguish this from *C. ambiens*. It is recorded sometimes on *Pyrus*, e.g. in Scott. Nat. 1887, p. 127, on *Pyrus communis* and *P. Aucuparia*, but I think wrongly. There are two possibilities, (1) the *Valsa* to which it belongs may be indistinguishable from others included under *V. ambiens*, or (2) it may be distinct.

Among a specimen on twigs of *Tilia* from Scotland, I found a *Valsa* with much smaller spores than *V. ambiens :* asci 40–50 × 7–8 $\mu$, spores 12–12·5 × 2·5–3 $\mu$. Therefore the latter case is probable, and it will be best *ad interim*, in the absence of cultural proof, to confine the name *carphosperma* to the form on *Tilia*, placing those on *Pyrus* under *C. ambiens* or elsewhere.

*Distrib.* Europe generally.

**C. ceratophora** *Sacc.* Syll. iii. 268. Allesch. vi. 572. Died. p. 342.

Stromata densely scattered, pustular, depressed-conical or convex, 500–750 $\mu$ diam., covered, then erumpent by a very small grey disc marked with a single black ostiole, plurilocular, with dark-olive contents; pycnidial walls several cells thick, of narrow olivaceous prosenchymatous cells; no conceptacle. Spores 4–5 × 1 $\mu$; sporophores simple or verticillately branched, acicular, 20–50 × 1 $\mu$.

On branches of *Castanea*, *Quercus*, *Ulmus*, etc. Kew Gardens; Middlesex; Warwickshire; Cheshire; Ayrshire, etc. Sept.–Nov. The pycnidial stage of *Valsa ceratophora* Tul.

The Warwickshire specimens were in company with a beautiful series of *V. ceratophora*, on dead shoots of the previous summer, sent up from the stool of a felled oak, Earlswood, Sept. 1917. These shoots had prematurely died owing to a severe attack of the oidial stage of *Microsphaera alphitoides* Griff. & Maubl., following on defoliation in the spring by larvæ of *Tortrix viridana*. On the Continent this *Cytospora* is recorded also on *Carpinus*, *Fraxinus*, *Rosa* (*C. Rosæ* Fckl.), *Sorbus*, etc., etc. Lind assigns to it "olivaceous tendrils."

*Distrib.* Europe generally.

**C. chrysosperma** *Fr.* Syst. Myc. ii. 542. Cooke, Handb. pp. 462, 822. Sacc. Syll. iii. 260. Allesch. vi. 591. Died. p. 353. *Naemospora chrysosperma* Pers. Syn. p. 108.

Stromata somewhat scattered, often flattened, but sometimes acutely conical, up to 2 mm. wide, covered, then erumpent by a cinereous-black disc, olivaceous-cinereous within; walls of loculi thick, very dark, subsclerotial, parenchymatous; loculi often irregular, no distinct conceptacle. Spores 4–5 × 1 $\mu$, issuing in long, large, copious, golden or yellow tendrils; sporophores filiform, somewhat branched, 10–15 × 1 $\mu$.

On living and dead bark of species of *Populus* (*P. alba*, *balsamifera*, *deltoides*, *nigra*, *serotina*, *tremula*, etc.) England, Scotland, Ireland; very common. May–Sept. The pycnidial stage of *Valsa sordida* Nits.

It causes a serious disease of Poplars in this country, and even more so in the United States, where great attention is directed to it. The *Cytospora* stage flourishes best during a wet summer, and then in the autumn the *Valsa* stage may be found in plenty on the thicker branches. When at its best, the stromata

look like a row of little volcanoes; the extruded spore-masses become deep amber in colour.

*Distrib.* Europe, North America, India.

*Cytospora populina* Rab. (*Naemospora populina* Pers. Sacc. Syll. iii. 747; Allesch. vii. 541) assumes a larger and clumsier form; it is said to have larger spores ($8 \times 1 \cdot 5\ \mu$), and to belong to *Valsa populina* Sacc., but it is not known as British.

**C. cincta** *Sacc.* Syll. iii. 254. Allesch. vi. 593. Died. p. 356.

Stromata aggregated, rather large, pustular, usually transversely erumpent, often with a number of perithecia surrounding the single central pycnidium; disc dingy-white or even brownish, mostly with a single ostiole; loculi of pycnidium one or few, rarely numerous and more or less radiating. Spores 6–8 (4–9) $\times$ 1·5–2 $\mu$, issuing in pale reddish tendrils; sporophores filiform, slender, usually simple, 10–15 $\times$ 1 $\mu$, rising from a thick brown parenchymatous wall.

On *Prunus Cerasus*, *P. domestica*, *P. spinosa*. Near Cambridge, Sutton Coldfield, and other places, but the specimens were all ill-developed. Spring. The spermogone of *Valsa cincta* Fr.

This species is common in Germany, and a variety is recorded on *Pyrus*. When fully developed, it is easily recognised by its ring of protruding perithecial ostioles on the disc, surrounding a central one belonging to the pycnidium. The mature stroma may measure as much as 2–3 mm. in diameter. Diedicke records it on *Prunus Padus*.

*Distrib.* France, Holland, Germany, Sweden.

**C. clypeata** *Sacc.* Syll. iii. 252. Allesch. vi. 600. Died. p. 360

Pycnidia scattered or sometimes in short longitudinal rows, 0·5–1 mm. diam., at first globose, bullate, covered, then splitting the epidermis longitudinally, at length conical, shining-brown outside, emergent and showing a small round dingy disc which finally becomes black and hard by the formation of a little dark mass of dense shining subcarbonaceous tissue around the ostiole of the subunilocular pycnidium; walls of pycnidium firm, rather thick, and brownish olive, of mixed parenchyma and prosenchyma. Spores about 6 $\times$ 1 $\mu$; sporophores filiform, 10–15 $\times$ 1 $\mu$.

On dead branches of *Rubus fruticosus*. Harborne and Kingswood, near Birmingham. Mar.–Apr. The pycnidial stage of *Valsella clypeata* Fckl. These specimens agree with Sydow, Mycoth. germ, no. 1709!

*Distrib.* Holland, Germany.

**C. Curreyi** *Sacc.* Syll. iii. 269. Allesch. vi. 573. Died. p. 330. Lind, in Annal. Mycol. 1907, v. 275.

Stromata conico-truncate or almost hemispherical, with a round or rarely oval base, 1–1·5 mm. diam., very protuberant, covered at the sides by the adherent stellately cleft periderm, with a dingy-brown disc provided with a single central papilla

which is pierced by a very minute pore (sometimes there are two or three papillæ), multilocular within, the numerous loculi arranged radiately or without order. Spores 3–6 × 1·5 $\mu$; sporophores usually simple, rarely branched, 20–24 or even 32 $\mu$ long.

On dead branches of *Larix europaea*, Roslin Glen and Forres (Boyd). Also on dead branches and cone-scales of *Picea*, *Pinus*, etc., not uncommon. The pycnidial stage of *Valsa Curreyi* Nits. Lind (*l.c.*) says "issuing in purple tendrils."

*Distrib.* France, Germany, Italy, Denmark.

**C. Euonymi** *Cooke*, in Grevill. xiv. 4. Sacc. Syll. x. 244. Allesch. vi. 580. Died. p. 341.

Stromata densely gregarious, covering large portions of the bark, rather small, at length blackish and shining, raising the browned epidermis conically, divided within into several irregularly arranged chambers, which converge into a common cavity, and emerge as a conical ostiole. Spores 5–7 × 1–1·5 $\mu$; sporophores crowded, mostly simple, 15–25 × 1 $\mu$.

On small twigs of *Euonymus americanus*, Kew Gardens (Cooke). On dead twigs of *Euonymus japonicus*, Hunterston, Ayrshire (Boyd). On dead branches of *E. japonicus*, Wisley, Surrey. Sept.

The tendrils are stated to be "pallid." Cf. *Cytospora foliicola* and *Ceuthospora euonymi* Grove (Journ. Bot. 1916, p. 190).

*Distrib.* Germany.

**C. foliicola** *Lib.* Exs. no. 64. Desm. in Ann. Sci. Nat. 1842, xvii. 117. Cooke, Handb. p. 754. Sacc. Syll. iii. 275. Allesch. vi. 567. Died. p. 332.

Stromata gregarious, about 350 mm. diam., covered by the epidermis, then erumpent, conico–depressed, black, containing few loculi; disc pallid, with a common central pore. Spores "7 × 1 $\mu$," issuing as a whitish tendril; sporophores filiform, equal, fasciculate, about 10–15 (or more) × 1 $\mu$.

On fallen leaves of *Hedera Helix*, Kew Gardens. On fading (not dead) leaves and small twigs of *Euonymus japonicus*, Sefton Park, Liverpool (Ellis) and Kew Gardens. March, etc.

This species has been much confused; all those specimens which I have seen on leaves of *Vinca* belong to *Ceuthospora Feurichi* Bubak, and many of those on *Euonymus* to *Ceuthospora Euonymi* Grove. It is nowhere common, but is recorded also on the Continent on leaves of *Acer*, *Crataegus*, *Quercus*, *Smilax*, etc. It is quite possible that all these are only leaf-forms of those species of *Cytospora* which occur on the branches and twigs: *e.g.* when on leaves of *Euonymus* it is possibly merely a form of *Cytospora Euonymi* (q.v.). The variable size of the spores given in books, "up to 12 $\mu$," is probably a result of this confusion, for on *Euonymus* leaves they measure only 4–6 $\mu$.

**C. Friesii** *Sacc.* Syll. iii. 269. Allesch. vi. 574. Died. p. 330.

Stromata scattered, small, conico-truncate, bursting through the epidermis by the blackish-grey disc which is pierced by one

or two slightly projecting ostioles; loculi few, circinating. Spores 4–5·5 × 1–1·5 $\mu$; sporophores fasciculate, mostly simple, 10–15 × 1 $\mu$.

On leaves and twigs of *Picea*. Not known with certainty as British, but extremely likely to occur here. The spermogone of *Valsa Friesii* Fckl.

It is found especially on the upper surface of the leaves, but also on the young twigs. The ascophorous stage follows on the main trunk and branches. Often included under *C. Pinastri* (q.v.).

*Distrib.* France, Belgium, Germany.

**C. Fuckelii** *Sacc.* Syll. iii. 263. Allesch. vi. 577. Died. p. 338.

Stromata widely but not densely scattered, obtusely and flatly conical, 500–750 $\mu$ broad, roundish, long covered by the epidermis, at length piercing it by the greyish disc which is marked with a black pore, multilocular within, the loculi roughly circinate, with thick walls composed of greenish-grey prosenchymatous cells. Spores 5–6 × 1·5 $\mu$; spore-mass greyish; sporophores acicular, curved, simple, 20–26 $\mu$ long.

On twigs of *Corylus Avellana*. Neston, Cheshire (Ellis). Dec. In company with *Valsa Fuckelii* Nits., of which it is the spermogone.

*Distrib.* Germany, Italy.

**C. fugax** *Fr.* Syst. Myc. ii. 544. Cooke, Handb. pp. 462, 827. Sacc. Syll. iii. 263. Allesch. vi. 576. *Variolaria fugax* Bull. pl. 432, f. 5.

Stroma little or none. Pustules prominent, 1–1·5 mm. broad, lens-shaped, concrete with the epidermis; loculi black, circinating round a central columella; disc flat or somewhat sunken, black or smoky-brown. Spores 6–8 × 1·5 $\mu$; tendrils slender, greyish-white, subhyaline.

On bark of *Salix* (*S. alba*, *fragilis*, *nigricans*, *viminalis*, etc.). Kew; Kent; Studley Castle, Wixford, etc., Warwickshire. Also recorded abroad on *Corylus*.

I am inclined to believe that this is not anything but the final state of *C. Salicis* (q.v.). When perfect, it consists of a circle of 6–20 black loculi, filled with a greyish mass, with almost no stroma perceptible, and forming a flattened covered pustule, up to 1·5 mm. wide, bursting through in the centre with a ragged opening. Bulliard gave it the name *fugax* because it seemed to disappear in a short time.

*Distrib.* Europe, Siberia, North America.

**C. germanica** *Sacc.* Syll. iii. 262. Allesch. vi. 604. Died. p. 355. Grove, in Journ. Bot. 1922, p. 45.

Stromata scattered or gregarious, conico-truncate or convex, with a roundish base, 0·5–1·25 mm. broad; disc whitish, then cinereous, at length marked with a small black central papilla

which is pierced by a pore; loculi numerous, radiately disposed, often imperfectly divided, walls of the chambers of thick brown prosenchymatous cells. Spores 5–6 × 1·5 $\mu$; sporophores crowded, long, slender, filiform, usually simple, 20–25 × 1–1·25 $\mu$.

On dead twigs of *Salix*. Sutton Coldfield. Apr. May. On the same twigs was an abundance of *Valsa germanica* Nits. of which it is the spermogone; when the two came close together, the 6–9 erect black ostioles of the *Valsa* formed a ring round about the spermogonial disc, piercing the periderm at a distance of 0·5–1 mm. away from it. This mode of occurrence is especially characteristic of this species. The grey disc of the *Cytospora* was occasionally pierced by two papillæ.

*Distrib.* Germany (on *Populus*), Finland.

**C. guttifera** *Fr.* Syst. Myc. ii. 545. Cooke, Handb. p. 462. Sacc. Syll. iii. 264. Allesch. vi. 578. Died. p. 339. *Sphaeria guttifera* DC. Flor. fr. vi. 136.

"Stromata immersed, plurilocular, black, attenuated into a conical obtuse erumpent neck; gelatinous contents issuing in a whitish globule. Spores oblong-cylindrical."

On branches of *Quercus*. Berkeley says "on dead Willow twigs." Also recorded in Germany on *Corylus* and *Tilia*.

"The loculi form a black tubercle, immersed in the bark, on which is placed a neck which perforates the epidermis. Globule at length black." (Fr.)

The globule perched on a subconical neck forms the distinguishing feature of this species, if indeed it be anything but a chance collection of forms in which the weather has caused the tendril to assume the shape of a globule, as I am inclined to think. The somewhat doubtful specimens seen have pustules, up to 0·75 mm. diam., immersed in the bark and surrounded by a sunken zone: for a long time they remain covered, but at length a dark grey disc with a thick neck protrudes; within are 1–3 black loculi immersed in a cinereous-brown stroma. They are not *C. ambiens*, since they have a distinct conceptacle.

*Distrib.* France, Germany.

**C. Harioti** *Briard*, in Rev. Mycol. 1889, p. 16. Sacc. Syll. x. 247. Allesch. vi. 591. Died. p. 354.

Stromata scattered or loosely gregarious, not crowded, 0·5–1 mm. diam., conical on a roundish base, or if oval longitudinally elongated, olivaceous-grey, deeply immersed, long covered by the epidermis, then splitting it by a dingy-brown disc, with usually a single blackish pore; loculi several, irregularly arranged, separated by thick brown walls. Spores 4–5 × 1·5 $\mu$; spore-mass quite colourless; sporophores acicular, 12–15 × 1 $\mu$.

On small twigs of *Populus*. Bromborough, Cheshire (Ellis). Jan.

*Distrib.* France, Germany.

**C. Hendersonii** *B. & Br.* Outl. Fung. p. 322. Cooke, Handb. p. 462. Sacc. Syll. iii. 252. Allesch. vi. 600.

Pustules small, scattered; pycnidium subsimple, thin, sometimes lobed at the margin; contents whitish. Spores oblong, gently curved, hyaline, 7–8 × 2·5–3 $\mu$, issuing in a formless mass.

On twigs of *Rosa arvensis*. Milton, Northe. (Berk.). The dimensions of the spores are taken from the original specimens. A doubtful species.

"Pycnidium nearly regular, but sometimes lobed at the edge, and raised in the centre from the elevation of the subjacent bark. Spores larger than in most *Cytosporae*, oblong, but short, very slightly curved, oozing forth in the form of a dirty-white shapeless jelly." (B. & Br.)

**C. Hippophaes** *Thüm.* Fung. Austr. no. 282. Sacc. Syll. iii. 274. Allesch. vi. 583. Died. p. 345.

Stromata small, 250–300 $\mu$ wide, scattered, rather prominent, covered by the darkened epidermis, at length erumpent, pallid, then black. Spores 4–6 × 1–1·25 $\mu$; sporophores fasciculate on a basal cell, 12–20 × 1 $\mu$.

On dead twigs of *Hippophaë rhamnoides*. Ayrshire (Boyd). Kew Gardens. Apr.–Nov.

In an Austrian specimen, issued by Thümen, the loculi are circinating and immersed in the bark; the pallid disc is at length pierced by a circle of several ostioles. In the Ayrshire specimens, the loculi may be as many as twelve, all circinating round a central grey or blackish disc, and each piercing it, at least in some cases, by a separate ostiole; the wall of each loculus is distinct and of a pale greenish colour. It is said to be the spermogone of *Massaria Hippophaes* Jacz. (*Sphaeria Hippophaes* Sollm.)

*Distrib.* Germany, Austria, Denmark.

**C. hyalosperma** *Fr.* Syst. Myc. ii. 545. Sacc. Syll. iii. 258.

"Stromata immersed, indistinctly cellular, black, as well as the conico-convex erumpent neck. Spores issuing in a colourless tendril."

On bark of *Acer Pseudoplatanus*. Kew Gardens. A very doubtful species, probably merely a form of one or more which have colourless spore-masses.

In the Kew specimens the spores are slightly curved, about 6 × 1 $\mu$, but the stromata are larger than usual in *Cytospora*. J. B. Ellis's American specimens, named *hyalosperma*, on *Acer rubrum*, are quite different in appearance; the spores are smaller, 4–5 × 1 $\mu$, and they are certainly not the same species. Fries says :—" small, without a depressed disc." Cf. *C. leucosperma*.

*Distrib.* Sweden, United States of America.

**C. Hyperici** *Grove*, in Journ. Bot. 1922, p. 45.

Stromata densely scattered, pulvinate, oval, up to 2 mm. long, convex, opening by a central pore surrounded by a minute

blackish disc, plurilocellate within; loculi more or less circinating, the walls thin and composed of greenish cells, like those of *C. Oxyacanthae* Rab. Spores 4–5 × 1 $\mu$; sporophores rod-like, straight, about 10 × 1 $\mu$.

On dead branches of *Hypericum*. West Kilbride, Ayrshire (Boyd). Sept.

**C. intermedia** *Sacc.* Syll. iii. 264. Allesch. vi. 595. Died. p. 357.

Stromata gregarious, pustular, multilocular, the loculi arranged radiately or without order round a central columella, opening by a single black papilla (rarely two) in the centre of a very small cinereous disc. Spores 5–6 × 1–1·5 $\mu$; sporophores occasionally branched at the base, 20–24 × 1·5 $\mu$, or frequently even longer.

On thin twigs of *Quercus Robur*. Kew Gardens. The pycnidial stage of *Valsa intermedia* Nits.

Earlswood specimens on Oak tend to show that *Valsa intermedia* Nits. is only a form of *Valsa ceratophora*: if so, *C. intermedia* must be merged in *C. ceratophora*.

*Distrib.* Germany.

**C. Jasmini** *Cooke,* in Grevill. xiv. 4. Sacc. Syll. x. 245. Allesch. vi. 583.

Stromata very loosely gregarious, somewhat conical, subcutaneous, small, covered by the darkened epidermis. Spores 6 × 1 $\mu$, oozing forth through a small orifice in the cuticle.

On thin twigs of *Jasminum officinale*. Kew (Cooke). Apr.

**C. juglandina** *Sacc.* Syll. iii. 267. Allesch. vi. 584. Died. p. 345.

Stromata gregarious, covered by the epidermis, which is occasionally cleft by the projecting subcylindrical ostiole, black, plurilocular within, with a distinct columella; loculi circinating. Spores rather straight, 6–7 × 1 $\mu$; sporophores filiform, 10–15 × 1 $\mu$.

On twigs of *Juglans regia*. Kew Gardens. May.

*Distrib.* Germany, Italy.

**C. Kerriae** *Died.* l.c. p. 346. Grove, in Journ.Bot. 1922, p. 45.

Stromata loosely gregarious, tearing the epidermis into laciniæ, erumpent, conical, with a blackish disc pierced by one or two pores, irregularly pseudolocellate within; texture dark-olive, a little paler inwards. Spores 6–8 × 1·5–2 $\mu$; sporophores fasciculate, mostly simple, 15–25 × 1 $\mu$.

On dry twigs of *Kerria japonica*. Saltcoats, Ayrshire (Boyd). July.

*Distrib.* Germany.

**C. Kunzei** *Sacc.* Syll. iii. 270. Allesch. vi. 574. Died. p. 351.

Stromata scattered, covered, immersed between the periderm and the cortex, up to 2 mm. broad, multilocular, the loculi

labyrinthiform or irregularly arranged, opening by a single pore (rarely by several pores) in the centre of a minute roundish greyish-yellow disc which alone is visible. Spores 4–5 × 1 μ, issuing in yellow, then saffron-coloured tendrils; sporophores linear, sparingly branched or rather fasciculate at base, 20–25 μ long.

On bark of *Picea excelsa*, *P. pectinata*. Kew Gardens; King's Lynn; Alnwick. Aug.–Oct. The spermogone of *Valsa Kunzei* Nits.

The walls of the loculi are dark brownish-grey in colour; contents dark olive-grey.

*Distrib.* France, Germany, Switzerland.

**C. Lantanae** *Bres.* in Rev. Mycol. 1891, p. 28, pl. 114. f. 6. Sacc. Syll. x. 245. Allesch. vi. 610. Died. p. 367. *Dendrophoma pruinosa* var. *Lantanae* Sacc. Syll. iii. 179. Allesch. vi. 403. *C. pulveracea* Berk. Eng. Flor. v. 283 (?)

Stromata scattered, 250–300 μ diam., black within and multilocular, causing a distinct roundish swelling beneath the epidermis, which finally pushes out, at the most prominent portion, only a minute grey disc, which is surrounded by the torn margin and at length pierced by a black ostiole; walls of the loculi rather thick, of dark olivaceous-brown tissue. Spores 5–8 × 1–2 μ; sporophores verticillately branched, or rather fasciculate on a basal cell, 18–20 × 2·5 μ; branches acute.

On dead twigs of *Viburnum Opulus*, *V. Lantana*, Cheshire (Ellis), Jan.–Apr. On dead branches of *V. Lantana*, Wilmcote, Wk. Sept. On leaves of *V. Tinus*, Apethorpe (Berk.), (?). The spermogone of *Valsa Viburni* Fckl.

Saccardo called it a *Dendrophoma* merely because it has branched sporophores, but that is now known to be true of several species of *Cytospora*. It has no close affinity with *C. pruinosa*. *C. Viburni* Fautr. in Rev. Mycol. 1891, p. 171, is probably only an early state of *C. Lantanae*.

*Distrib.* France, Hungary, Italy.

**C. Lauri** *Grove*, in Journ. Bot. 1922, p. 45. *Ceuthospora Lauri* Sacc. Syll. iii. 279, p.p.; non *Ceuthospora Lauri* Grev.

Pycnidia scattered, conical, truncate, 0·5–1 mm. diam., with a rather large whitish furfuraceous disc at length marked with a minute black pore, dark-olive within, composed (when perfect) of many compact narrow radiately arranged pseudo-locelli or labyrinthiform chambers; walls of the locelli (under the miscroscope) thick and dark-brown, without a trace of green; no conceptacle. Spores 4–5 × 0·75–1 μ, rather more acute at the ends than is usual; sporophores linear, not very crowded, more or less curved, 10–12 × 1 μ.

On dead twigs of *Laurus nobilis*. West Kilbride, Ayrshire (Boyd). May.

Greville's mistake in calling our "Common Laurel" *Laurus nobilis* was perpetuated by Saccardo (Syll. iii. 279), and has

led to considerable misunderstanding. His specimens were on *Prunus Laurocerasus*, as was well known to his contemporaries: "*Ceuthospora Lauri*," as he called them, is very common, but *Cytospora Lauri* is rare in Britain.

*Distrib.* Belgium, Austria, Italy.

**C. Laurocerasi** *Fckl.* Enum. F. Nass. no. 437; Symb. Myc. p. 398; Nachtr. i. p. 27. Tul. Sel. Fung. Carp. ii. 196. Sacc. Syll. iii. 276. Allesch. vi. 593.

Stromata on a rounded base, conical, obtuse, black, slightly locellate within, with a distinct conceptacle; disc round, protruding, cinereous-white, with a black central ostiole. Spores 5–6 × 1 $\mu$, issuing in long slender deep-red or purplish tendrils; spore-mass tinged with purplish-red under the microscope; sporophores acicular or slightly subulate, fasciculate at the base, granular-guttulate, up to 20 × 1·5 $\mu$.

On dead leaves and on branches of *Prunus Laurocerasus*. The spermogone of *Valsa Laurocerasi* Tul.

The form on the leaves does not differ from that on the branches, except that the former is never accompanied by the ascophorous state, as is the latter. This species has been much confused with *C. Prunorum* Syd. and with *C. cincta* Sacc., both of which have longer spores, and belong to different species of the Valsei. It must also be remembered that it is quite different from *Ceuthospora Laurocerasi* Grove, which has pycnidia of a very diverse nature, and no tinge of purple in its spore-mass.

*Distrib.* France, Germany, Italy, Austria.

**C. leucosperma** *Fr.* Syst. Myc. ii. 543. Cooke, Handb. pp. 462, 826. Sacc. Syll. iii. 268. Allesch. vi. 567. Died. p. 333. *Naemospora leucosperma* Pers. Syn. p. 108.

Stromata small, widely scattered, 500–750 $\mu$ diam., black, raising the epidermis convexly, and at length piercing it by the round flat whitish disc marked with a black ostiole; loculi several, united in the centre, often confluent in a lobed mass; walls rather thick, greyish-green, prosenchymatous; no conceptacle. Spores 4·5–5·5 × 1·25–1·5 $\mu$, issuing in white tendrils; sporophores filiform, often simple, 15–16 × 1 $\mu$.

On twigs and branches of various rosaceous trees, *Crataegus*, *Prunus*, *Pyrus*, *Rosa*, and also on *Acer Pseudoplatanus*, etc. Considered common; summer and winter.

This species is recorded abroad on *Carpinus*, *Cytisus*, *Fagus*, *Ilex*, etc.; but not always correctly, for it differs from its allies in hardly anything but the white tendrils, which show little or no tendency to become yellowish at first. Nevertheless, as is explained below, it is possibly merely a state of *C. ambiens*.

*Distrib.* Europe, North America.

**C. leucostoma** *Sacc.* Syll. iii. 254. Allesch. vi. 592. Died. p. 356. *Sphaeria leucostoma* Pers. Syn. p. 39. *C. nivea* "Fckl.", Cooke, Handb. p. 822. *C. rubescens* Fr. p.p.

Stromata often crowded, lenticular or conical, up to 1 mm. broad, blackish, immersed, then erumpent (on the larger branches most often transversely), multilocular; loculi (when perfect) narrow, radiating, walls of brown prosenchymatous cells, no columella; disc emerging, flat, snow-white, pierced by one or two black ostioles. Spores 5–6 × 1 $\mu$, issuing in reddish tendrils; sporophores filiform, usually simple, rarely branched, 12–20 × 1 $\mu$.

On bark of *Prunus Cerasus*, *P. domestica*, *P. insititia*, *P. Padus*, and other species of *Prunus*. On *Cotoneaster bacillaris*, Kew (Cooke); a similar form on a dead *Cotoneaster*, Ireland. In some districts not uncommon on cultivated Plums, and a weak parasite. Autumn and winter. The pycnidial stage of *Valsa leucostoma* Fr., which often accompanies it.

In good specimens the round white disc, marked in the centre with a black "eye," is very conspicuous. The spore-mass, when seen in water under the microscope, is distinctly pinkish-red; the fresh tendrils are of the colour called by artists "light-red" not the deep purplish-red of those of *C. rubescens* and *C. Prunorum*. As the *Cytospora*-stage changes into the *Valsa*, the one or two ostioles increase to several less prominent ones. *C. cincta*, also on species of *Prunus*, resembles this species, but has generally fewer loculi and a dingy-whitish disc.

*C. leucostoma* is stated (Rep. South Afr. Assoc. Adv. Sci. 1915, p. 545) to cause the disease called the "Die-back" of Apple trees, but probably this is a mistake of identification. Cf. *C. rubescens* Tul. and *Valsa Mali* Miy. & Yan.

*Distrib.* Europe and Siberia.

Stevens (Illin. Agric. Expt. Sta. Bull. no. 217) found a *Cytospora* causing a canker on twig of Apple, which he was inclined to put under *C. leucostoma*, but he did not arrive at a definite conclusion. He found that he could transfer it readily, in pure cultures, from Apple to Pear, Rose, Plum, Peach and *Rubus*, on all of which it grew freely (but not on Cherry or *Acer*). On *Rubus* the pycnidia were smaller.

**C. Lonicerae,** sp. n. Stromata subsparsa, 200–300 $\mu$ diam., rotundata, nigrescentia, immersa, sæpe halone brunneo-rubro cincta, tandem poro atro tantum emergentia (disco obsoleto), intus subunilocularia, vel e loculis paucis rotundis crasse contextis composita; sporulæ hyalinæ, 5–6 × 1 $\mu$, allantoideæ, sporophoris subulatis subsimplicibus 12–15 × 1 $\mu$ suffultæ.

*Hab.* in ramulis *Lonicerae*, Cheshire (Ellis), Maio.

Distinguished from the spermogonial stage of *Valsa olivacea* Fckl. (Symb. Myc. Nachtr. i. 27) by the minute pycnidia and the much smaller spores.

**C. microspora** *Rabenh.* Deutsch. Kr. F. p. 147. Sacc. Syll. iii. 253. Allesch. vi. 578. Died. p. 340. *Naemospora microspora* Cord. Ic. iii. 26, f. 69, p.p.

"Stromata gregarious, raising the epidermis conically; then bursting it by the protruding black disc; texture dark, fuliginous,

within olive-brown, in the upper part in young pustules almost orange-red; loculi incomplete, circinating round a central columella, with a common opening. Spores 6–8 × 1. $\mu$; sporophores rod-shaped, 10–20 × 1½ $\mu$." (Died.)

On *Crataegus* and *Pyrus Malus*. Cheshire (Ellis). Spores 5–6 × 1 $\mu$, issuing in a white tendril. Spring.

This species is recorded on *Sorbus Aucuparia*, *S. domestica*, and other hosts on the Continent, as well as on those named above. Cooke issued specimens which he named *C. microspora* Cord. var. *Amelanchieris* (on *Amelanchier*, Kew Gardens), but he afterwards transferred them (Grevill. xiii. 96) to *C. microstoma* Sacc. Probably the second name was a slip of the pen. There has been great confusion between *C. microspora* and *Naemospora microspora*, and, as is shown below, *C. microspora* (Corda) Rabenh. should probably be suppressed, and the species arranged under other heads. On account of this, I have preferred to reproduce above merely Diedicke's description.

**C. microstoma** *Sacc.* Syll. iii. 254. Allesch. vi. 593. Died. p. 355.

Stromata convex, more rarely conical, with a roundish-oval base, usually 500–650 $\mu$ diam., multilocular within, the loculi arranged round the circumference; walls of pycnidial chambers olivaceous-yellow when young; the dingy disc furnished with a single pore (or rarely several). Spores proportionately rather thick, 5–6 × 1·5 $\mu$; spore-mass nearly colourless; sporophores rather thick, branched, about 28 $\mu$ long.

On branches of *Prunus Laurocerasus*, *P. spinosa* and other species of *Prunus*. Not uncommon. The pycnidial stage of *Valsa microstoma* Nits.

A variety *Cotoneastri* (on *Cotoneaster frigida*) is assigned to this species in Grevill. xiii. 95, and Sacc. Syll. x. 244. It has the pycnidial walls thick, of brown parenchymatous cells.

*Distrib.* France, Germany, Italy, Sweden, Russia.

**C. nivea** *Sacc.* Syll. iii. 260. Allesch. vi. 590. Died. p. 354. *Sphaeria nivea* Hoffm. Veg. Crypt, i. 28 p.p. Non *C. nivea* Fckl.

Stromata gregarious, 500–750 $\mu$ diam., between conical and discoid, immersed, then erumpent, black, dark-fuscous within, with numerous small loculi; walls thick and dark; disc emerging, roundish, snow-white, with a central black pore. Spores 6–7 × 1·5–2 $\mu$, issuing in reddish tendrils; sporophores 10–13 × 1·5 $\mu$.

On bark of *Populus nigra*, *P. tremula*, etc., Kew; Hampstead; Sutton Coldfield; Scarborough; Ayrshire, etc. Perhaps rather common, but not so abundant as *C. chrysosperma*. The pycnidial stage of *Valsa nivea* Fr.

Like many species of *Cytospora*, this has been much confused, and is recorded on various trees; but it will be best to follow Saccardo and consider it as confined to *Populus*. The white disc, marked with a black " eye " as in *C. leucostoma*, is sometimes very conspicuous, but, as usual, when the *Valsa*-stage supervenes, the central black ostiole is replaced by a ring of perithecial mouths.

Sydow's specimens (Mycoth. March. no. 2290), on *Prunus Padus*, are *C. leucostoma*.

*Distrib.* France, Holland, Germany, Italy, Denmark, Siberia, United States of America.

**C. occulta** *Sacc.* Syll. iii. 258. Allesch. vi. 568.

"Pycnidia nestling beneath the bark, connate; contents grey. Spores very minute, cylindrical, curved, $6 \times 1 \cdot 5$ $\mu$, expelled in golden tendrils from a common tuberculate pore."

On dry branches of *Alnus glutinosa*. Regent's Park (Cooke). Apr. Very uncommon. According to Fuckel it is the pycnidial stage of *Melanconis occulta* Sacc. Cf. *Cytospora diatrypa*, which has not yet been found in Britain.

*Distrib.* Germany, Denmark.

**C. Oxyacanthae** *Rabenh.* in Bot. Zeit. 1858. p. 503. Sacc. Syll. iii. 255. Allesch. vi. 579. Died. p. 339.

Stromata gregarious, but not very crowded, covered, when fully developed hemispherical on a rounded base, swollen, up to 1 mm. diam., bursting irregularly at the summit and showing a small disc, which is at first whitish, then when old blackish, marked with 1–3 inconspicuous black ostioles; loculi numerous more or less labyrinthiform, but frequently arranged in a conspicuously radiating manner; walls dark-grey; central columella black, often very distinct; walls of conceptacle thick and blackish, walls of the loculi composed of a rather thin greyish-green tissue of narrow elongated cells. Spores 6–7 (rarely 8) $\times$ 1–1·5 $\mu$, issuing as a white tendril; spore-mass whitish; sporophores subulate, fasciculate at base, occasionally branched above, 15–25 $\times$ 1–1·25 $\mu$ (10–13 $\times$ 1 $\mu$, Died.), springing direct from the prosenchymatous wall at right angles.

On dead twigs, and especially on hedge-cuttings and stakes, of *Crataegus Oxyacantha*. Abundant; Warwickshire; Worcestershire; Cheshire; Ayrshire, &c. Frequently accompanied by a form of *Valsa ambiens* Sacc. No doubt very common, but mostly placed by collectors under *C. leucosperma*. Recorded abroad on *Cydonia*, *Pyrus* and *Sorbus*; also on *Quercus*, but this latter is doubtless a mistake.

The epidermis is swollen by the mass of spores for some distance round the disc, so that the full grown pustules are not conical, but hemispherical. The disc may remain pale and pruinose at the edge. The tissue of the walls of the loculi is unlike that of many Cytosporas, being composed of long prosenchymatous grey-green thick-walled cells, about 2·5 $\mu$ wide, closely resembling those of the leaf of *Hypnum cupressiforme*. By this it is easily distinguished from the otherwise similar *C. ambiens*, which has the walls of the pycnidia composed of thick dark-brown parenchymatous cells. *C. carphosperma* is also very similar, but is distinguished by its host, and by the yellowish colour of the freshly exuded tendrils.

*Distrib.* France, Holland, Germany, Austria, Italy, Denmark, Sweden.

**C. Palmarum** *Cooke*, in Grevill. xiii. 95. Sacc. Syll. x. 249. Allesch. vi. 587.

"Stromata immersed, then erumpent, loosely gregarious, 0·5–1 mm. diam., at first covered, then cracking the epidermis; loculi few. Spores profuse, 6 × 1 $\mu$."

On petioles and leaves of Palms. Kew Gardens (Cooke). Apr.

**C. Pinastri** *Fr.* Syst. Myc. ii. 544. Cooke, Handb. p. 462. Sacc. Syll. iii. 725. Allesch. vi. 575. Died. p. 330.

Stromata on both sides of the leaves, about 250 $\mu$ diam., more or less globose, immersed, then erumpent, conical, plurilocular, loculi few and imperfect; pycnidial wall of dark brown interwoven hyphæ; disc rounded, tuberculose, blackish, nearly obliterated by the black shining prominent ostiole. Spores 4–5 × 1–1·5 $\mu$, issuing in a formless milk-white tendril; sporophores fasciculate, acicular or flexuous, 20–25 × 1 $\mu$, rising from a pale greenish-olive parenchymatous stratum.

On dead leaves of *Pinus sylvestris*. England, Scotland. Not common.

"Loculi irregular, nestling in the parenchyma of the leaf. Disc very prominent, opaque, rugose, then flatter, cinereous-black, with a very prominent ostiole." (Fr.). This species is recorded abroad on *Abies*, *Cryptomeria*, and *Cupressus*; but probably what has been so named on *Abies* is *C. Friesii* (the spermogone of *Valsa Friesii* Fckl.) q.v. A similar form occurs on leaves of *Thuja*, Scotland (Boyd).

Var. **Taxi** *Westd.* *C. taxifolia* Cooke & Mass. in Grevill. xviii. 73. Sacc. Syll. x. 248. Allesch. vi. 608.

In this variety the stromata are sometimes slightly larger, and occur more often on the upper face of the leaf, splitting the epidermis by the long black ostiole, which stands up conspicuously above it.

On dead leaves of *Taxus baccata*. Carlisle; Rugby; Glamis. Summer.

The spores of the original specimen of *C. taxifolia* are exactly like those of *C. Pinastri*, but the sporophores are shorter. From Shrawley (Worcs.), Dr. J. W. Ellis communicated a specimen, on leaves and twigs of Yew, which differed only in having larger spores (7–9 × 1 $\mu$). Cf. *C. Taxi* Sacc. Syll. iii. 271.

*Distrib.* Europe, North America.

**C. Pini** *Desm.* in Ann. Sci. Nat. 1843, xix. 362(?). Sacc. Syll. iii. 270. Allesch. vi. 575. Died. p. 351. *C. pinicola* Westd.; non *C. Pini* Fckl. Fung. Rhen. no. 628.

Stromata scattered, immersed, without any distinct conceptacle, up to 2 mm. diam., the loculi numerous, black, oblong, irregularly circinating; contents greyish-green; disc flat, erumpent, smoky-black; ostiole usually one only, prominent,

black, shining; walls of loculi thin, of dark-brown prosenchymatous cells. Spores 4 × 1 $\mu$, issuing in sulphur-coloured, then lemon-coloured tendrils; sporophores filiform, branched, 20–25 × 1 $\mu$.

On bark of *Pinus sylvestris*. Twycross (Berk.); Cheshire (Ellis). The pycnidial stage of *Valsa Pini* Fr. Westendorp records his form (*C. pinicola*) on *Cedrus Libani*, with spores 6·5 $\mu$ long. The species is also recorded on *Pinus Strobus* and on *Cupressus*.

The Cheshire specimens have numerous small crowded stromata; disc flat, 0·5 mm. diam. or less, erumpent, smoky black, pierced and in some cases nearly obliterated by a large prominent hemispherical black shining ostiole; spores as above; sporophores somewhat acicular, sparingly branched, acute, 15–18 $\mu$ long, colourless and springing from a dusky-olive proliferous stratum.

*Distrib.* France, Belgium, Germany, Denmark, Dalmatia.

**C. Platani** *Fckl.* Enum. F. Nass. p. 52. Sacc. Syll. iii. 267. Allesch. vi. 590. Died. p. 352.

Pycnidia numerous, gregarious, roundish, about 500 $\mu$ diam., black, raising the epidermis in the form of a tubercle without distinct conceptacle or stroma, divided irregularly into incomplete chambers, walls of clear-brown tissue. Spores 6–8 × 0·5–1 $\mu$, issuing in very slender long flexuous pure-white tendrils; sporophores filiform, longer than the spores.

On the smaller dead branches of *Platanus acerifolia*. Kew Gardens. Apr.

*Distrib.* France, Holland, Germany, Austria, Italy.

**C. pruinosa** *Sacc.* Mich. i. 519. *Sphaeria pruinosa* Fr. Syst, Myc. ii. 486 p.p. *Dendrophoma pruinosa* Sacc. Syll. iii. 179. Allesch. vi. 403. *Cytospora melasperma* Fr. var. *Fraxini* Allesch.

Pycnidia gregarious, immersed, depressed, adnate to the periderm, covered with a greyish pruina, with a bullate erumpent ostiole. Spores hyaline, then yellowish, 5–7 × 0·5–1 $\mu$; sporophores verticillately branched, 4–5 times longer than the spore.

On branches of *Fraxinus excelsior*. Twycross (Berk.).

var. **Ligustri** *Strasser*, in Verh. k.-k. Zool. Bot. Gesell. Wien, 1900, lx. 311.

Pycnidia globose, unilocular, attenuated into a very short neck, ostiole conico-truncate, but scarcely protruding beyond the pierced periderm, at length collapsing. Spores 5–6 × 1 $\mu$, issuing in olivaceous or greenish-black tendrils.

On twigs of *Ligustrum vulgare*. Regent's Park (Cooke). West Kirby (Ellis). Stevenston, Ayrshire (Boyd). Jan.–Jun.

Strasser places this variety under "*Dendrophoma pruinosa*," which is what Tulasne states to be the spermogone of his *Valsa Cypri* on *Ligustrum*. *Valsa Cypri* also occurs on *Fraxinus*, but the British specimens on *Ligustrum* may not belong to that species.

*Distrib.* France, Germany, Austria, Italy, Sweden, North America.

**C. Prunorum** *Sacc. & Syd.* in Annal. Mycol. 1904, ii. 191. Mycoth. Germ. no. 136 !; Syll. xviii. 297. Died. p. 355. *C. rubescens* Kalch. in Bot. Zeit. 1864, p. 174 (non Fr., quæ *C. leucostoma* saltem p.p.)

Stromata loosely gregarious, conico-truncate, 1–1·5 mm. broad, covered, then erumpent by a transverse fissure, greyish-olive, multilocular round the circumference; disc whitish, marked with a black pore, then becoming blackish; texture of walls indistinct; no conceptacle. Spores 6–8 × 1·5–2 $\mu$, issuing in deep-red tendrils; spore-mass distinctly pinkish; sporophores rod-like, crowded, simple or forked, 22–26 × 1·5 $\mu$.

On branches of various species of *Prunus* (including *Amygdalus*, etc.). Not uncommon. Winter and spring. The pycnidial stage of *Eutypella Prunastri* Sacc.

Differs from *C. rubescens* Tul., with which it was formerly confused, in the longer spores. A form of it has been proved by Frank and by Rostrup to cause the death of Cherry trees. Cf. Verh. Nat. Ver. Hamb. 1905, p. 66, and also *C. cerasicola* Sacc.

*Distrib.* Europe, North America.

**C. rhodophila** *Sacc.* Syll. iii. 253. Allesch. vi. 599. Died. p. 360.

"Stromata minute, conico-truncate, with a few spurious loculi radiately arranged, opening by a single central pore. Spores 5–7 × 1 $\mu$; sporophores very slender, rather short (10–12 $\mu$), usually simple, bearing the spores only at the apex."

On dry branches of *Rosa canina*. The pycnidial stage of *Valsa rhodophila* Nits. *(n.v.)*

*Distrib.* Holland, Germany.

**C. rhoina** *Fr.* Syst. Myc. ii. 546. Sacc. Syll. iii. 257. Allesch. vi. 598.

Stromata scattered, round, 250–500 $\mu$ diam., convex, bullate, long covered by the bark, at length bursting it by a slit which afterwards becomes round and wider; contents pallid, then blackish. Spores about 5 $\mu$ long, rarely issuing in pallid tendrils.

On branches of *Rhus glabra*, *R. radicans*, Kew Gardens, May–Aug. Specimens doubtful.

Forming globose, rather solid tubercles, like a soft sclerotium, with indistinct loculi. Cf. *C. marchica* Syd. in Hedwig. 1900, p. (3); Sacc. Syll. xvi. 902.

*Distrib.* Germany, Hungary, Sweden, North America.

**C. Rosarum** *Grev.* in Bail, Syst. Pilz. p. 81, pl. 14. Sacc. Syll. iii. 253. Allesch. vi. 600. Died. p. 360.

Stromata more or less gregarious, 250–300 $\mu$ diam., covered, at last erumpent, conical on a circular base, locellate within and nearly black, surrounded by the epidermis which is occasionally reddened or discoloured, loculi rather few, more or less grouped

round the circumference or sometimes there is only one chamber lobed round the margin; walls of loculi thick and brown; no conceptacle; disc small, greyish, marked with 1–4 shining black bullate ostioles. Spores 4–5 × 1–1·25 $\mu$; spore-mass nearly colourless; sporophores simple, somewhat curved, crowded, or fasciculate at base, 15–20 × 1 $\mu$.

On branches of *Rosa canina*, ? *R. tomentosa*. Scarborough (Massee); Cheshire (Ellis); Ayrshire (Boyd); Hereford. Autumn and spring. Said to be the pycnidial stage of *Valsa Rosarum* De Not. = *V. ceratophora*, var. *Rosarum* Sacc. Syll. i. 109.

*Distrib.* France, Germany, Italy, Austria, Poland, United States of America.

**C. rubescens** *Tul.* Fung. Carp. ii. 187. Died. p. 352. [Fr. Syst. Myc. ii. 542. Cooke, Handb. pp. 462, 821. Berk. Engl. Flor. v. 281. Sacc. Syll. iii. 253. Allesch. vi. 588. All p.p.]

Stromata not crowded, bullate or subdepressed, covered, 1–2 mm. broad; disc erumpent, most often transversely, flattish, dingy, then blackish; loculi numerous, circinating. Spores 3·5–4 × 1 $\mu$, issuing in deep-red tendrils; spore-mass distinctly pinkish under the microscope; sporophores rod-like, usually straight, 15–24 × 1–1·5 $\mu$.

Abundant on bark of *Sorbus Aucuparia*, also on species of *Pyrus*. Winter and spring. The pycnidial stage of *Eutypella Sorbi* Sacc.

Often confused with *C. leucostoma* or with *C. Prunorum*, which also have reddish tendrils. The so-called spermogonial stage of "E. Prunastri" on Apple (Board Agric. Leaflet, no. 87, 1st ed.) is this species.

*Distrib.* Europe, Siberia, North America.

**C. Salicis** *Rabenh.* Deutsch. Kr. Flor. Fung. no. 1340 (1844). Sacc. Syll. iii. 261. Allesch. vi. 603. Died. p. 361. *Naemospora Salicis* Cord. Ic. iii. 26, pl. 4, f. 70, p.p.

Stromata loosely gregarious, convex, blackish, mostly 400–500 $\mu$ diam., but sometimes larger, covered by the rarely discoloured epidermis, then erumpent; disc greyish, emergent, pierced by one or more ostioles; loculi confluent, forming a star-shaped or labyrinthiform pallid or grey mass. Spores 4–6 × 1–1·25 $\mu$, issuing in a pallid tendril; sporophores densely crowded, rod-like or subulate, sometimes slightly branched 20–25 × 1 $\mu$.

On dead twigs of *Salix* (*S. alba, fragilis, pentandra, purpurea, viminalis, vitellina*, etc.) Very common, England, Wales, Scotland, Ireland. Dec.–Aug. The pycnidial stage of *Valsa salicina* Fr.

Spores occasionally longer, 7–8 $\mu$ or even more; periderm often shining where discoloured round the disc, which pierces it without tearing it. This species is smaller than *C. fugax*, which has almost no stroma and has more distinct and well-formed

loculi. Nevertheless *C. fugax* is probably only a later state of the same fungus.

*Distrib.* Europe, India, North and South America..

**C. Sambuci** *Died.* in Annal. Mycol. 1906, iv. 414; Pilz. Brand. p. 363. Smith, in Trans. Brit. Myc. Soc. 1910, iii. 222. *C. Smithiae* Sacc. & Trott. Syll. xxii. 958.

Stromata gregarious, up to 1 mm. diam., rather flat, but projecting by a broadly conical mouth, subunilocular or plurilocular, the loculi arranged round a central black columella. Spores 5–6 × 1–1·5 $\mu$; sporophores filiform, simple, up to 25 $\mu$ long.

On dead bark of branches of *Sambucus nigra*, causing small round dark swellings. Wirksworth, Derbyshire (Gibbs). Oct.

Diedicke describes it as "on elongated bleached patches of the periderm," but there cannot be any doubt that these specimens are the same species as those described by Miss Smith.

*Distrib.* Germany.

**C. Sarothamni** *Sacc.* Syll. iii. 272. Allesch. vi. 606. Died. p. 363. Ellis, in Trans. Brit. Myc. Soc. 1916, v. 229.

Stromata densely gregarious, tuberculiform, black, depressed-convex, within dark-olivaceous and multilocular, at length opening above by a pore or a minute fissure in the epidermis; disc grey, ostiole black. Spores 7–10 × 1·5–2 $\mu$; sporophores densely crowded, 12–20 × 1 $\mu$.

On rather thick branches of *Cytisus* (*Sarothamnus*) *scoparius*. Darenth (Cooke). Cheshire (Ellis). Feb.-Apr. Said to be the pycnidial stage of *Eutypa macrospora* Sacc. The stroma contains numerous small loculi circinating round a central one.

*Distrib.* Germany, Denmark.

**C. Staphyleae** *Cooke* in Grevill. xiv. 4. Sacc. Syll. x. 246. Allesch. vi. 608.

Stromata flattened, consisting of two or three loculi, covered by the slightly raised epidermis which opens by a small elevated white-margined pore. Spores 6 × 1 $\mu$.

On branches of *Staphylea pinnata*, *S. trifoliata*. Kew Gardens (Cooke). Apr. A species of which little is known. Cooke has also described a *Cytosporina* (spores 20–25 $\mu$ long) on the same host.

**C. subclypeata** *Sacc.* in Malpigh. 1896, x. 273, pl. 6, f. 1; Syll. xiv. 917. Grove, in Journ. Bot. 1922, p. 46.

Stromata scattered, pustular, 500–750 $\mu$ diam., swollen, covered by the shining blackish-brown epidermis, grey within and unequally plurilocellate; disc minute, grey. Spores 4–5 × 1 $\mu$; sporophores verticillately branched, 25 × 1 $\mu$, branches acute.

On dead branches of *Rhododendron*. Bidston, Cheshire (Ellis). Ayrshire (Boyd). Edgbaston Botanic Gardens, Birmingham. May-Nov.

In these specimens the epidermis over the pustules is dark reddish-brown, shining especially at the apex when young. Many of the sporophores are rather fasciculate at the base than

branched; spores 3–6 × 0·75–1 $\mu$; spore-mass colourless under the microscope.

*Distrib.* Siberia.

**C. Symphoricarpi,** sp. n. Pycnidia sparsa, basi rotundata, conica, 250–300 $\mu$ diam., tandem disco minuto orbiculari cinereo poro centrali pertuso erumpentia, intus vix locellata; sporulæ allantoideæ, 4–5 × 1 $\mu$, sporophoris nullis visis.

*Hab.* in ramulis emortuis *Symphoricarpi racemosi*, Ayrshire (Boyd), Sept. The pore often entirely obliterates the disc.

**C. Syringae** *Sacc.* Syll. iii. 272. Allesch. vi. 608. Died. p. 364.

Stromata minute, bursting through the periderm by minute longitudinally arranged fissures, multilocular, the loculi arranged without order, very minute, opening usually by a single pore in the centre of a grey, then fuscous-brown, disc. Spores 5 × 1 $\mu$; sporophores very densely tufted, slightly branched, slender, up to 60 $\mu$ long.

On branches of Lilac (*Syringa vulgaris*). Apethorpe (Berk.). The spermogone of *Valsa Syringae* Nits.

Distinguished by its very small stromata, which are rather crowded and burst through the periderm by minute pores or chinks or stellate cracks. Berkeley's specimen is exactly similar to Roumeguère's (Fung. Gall. Exs. no. 3970 !).

*Distrib.* Belgium, Germany, Italy, Russia.

**C. translucens** *Sacc.* Syll. iii. 261. Allesch. vi. 602. Died. p. 362.

Stromata scattered, very small, blackish, not raising the epidermis much, opening by a single central pore (more rarely by two or three) in a minute whitish dark-margined disc which alone projects, containing within a few radiately arranged loculi or even nearly undivided. Spores 4–5 × 1–1·25 $\mu$; sporophores filiform, very slender, up to 40 $\mu$ long (5–12 × 0·5–1 $\mu$, soon disappearing, Died.).

On twigs of *Salix babylonica*, etc. Kew Gardens. Spring. The pycnidial stage of *Valsa translucens* De Not.

The disc is at first blackish, but later becomes whitish-grey, beginning in the middle and so leaving the margin dark. The black stromata shine through the translucent epidermis. There seems to be some error in Diedicke's description of the sporophores.

*Distrib.* Germany, Italy, Denmark, Finland, Russia, North America.

**C. Vaccinii** *Died.* Pilz. Brand. p. 366. *C. Myrtilli* Grove, in Journ. Bot. 1918, p. 294.

Stromata scattered, raising the somewhat blackened epidermis conically and piercing it with the blackish disc, about 600 $\mu$ diam., paler within and pseudo-locellate, with a single ostiole. Spores 4–5·5 × 1 $\mu$; sporophores filiform, fasciculate, mostly simple, 10–15 × 0·75–1 $\mu$ (30–40 × 1 $\mu$, in the Scottish specimens).

On dead stems of *Vaccinium Myrtillus*. West Kilbride, Ayrshire (Boyd). Mar.

The slightly convex pustules of the cinereous stroma show dark through the epidermis, which is at length pierced at the centre, it may be by a simple blackish ostiole, it may be by a whitish pruinose disc in which lie 1–5 round ostioles.

*Distrib.* Germany.

## Excluded Species.

The four following species, which have been recorded as British, must be excluded from our present list :—

**C. macilenta** *Rob. & Desm.* in Ann. Sci. Nat. 1849, xi. 352. Sacc. Syll. iii. 258. Allesch. vi. 565.

This species is recorded "on dry branches of *Acer obtusatum*," at Kew Gardens, but entirely in error. It normally occurs on *Cornus mas*, and is also stated in books to be found on *Acer Negundo* and *Staphylea pinnata*. But Desmazières afterwards came to the conclusion that the host of his specimens, said in the "Annales" to be *Acer Negundo*, was not that plant, but, as he states on his exsiccatum, "*Staphylea pinnata*," and, later still, Westendorp decided that they are on, not *Staphylea*, but *Cornus mas*.

**C. Ribis** *Ehr.* The only British specimen which I have seen under this name—"On *Ribes*, Swanscombe (Cooke)"—appears to be nothing but *Diplodia*.

**C. decipiens** *Sacc.* This species seems to be more likely to be a *Naemospora*. I have seen no specimens, but at any rate, judging by the description, it cannot be a *Cytospora*.

**C. stictostoma** *Grove*, in Journ. Bot. 1916, p. 190.

This species is a *Phomopsis* (*Ph. stictostoma*). The false name was given to it through inexperience; at that time it was not recognised that *Phomopsis* often has a plurilocellate or lobed pycnidium similar to that typical of *Cytospora*.

*Cytospora Acharii*, *C. flavo-virens*, and *C. stellulata* belong to the genus *Cytosporina*, and must also be excluded.

In addition to these it should be remarked that, in all probability, the following names from those previously mentioned will be suppressed by future mycologists, unless they are adopted in a restricted sense or with a new meaning :—

| | |
|---|---|
| *C. hyalosperma* | *C. microspora* |
| *C. leucosperma* | *C. guttifera* |

Even if original type specimens are available, they will be of little use, since many species of *Cytospora* are so extremely like one another. I was first convinced of the truth of this by finding what seemed to be excellent examples of Fries' *leucosperma* on *Acer Pseudoplatanus*; the tendrils, naturally produced, when first seen appeared perfectly white, and the other characters

agreed fairly well; moreover Saccardo has already recorded a form of "*C. leucosperma*" on *Acer campestre*. But, when the branches were kept for some days, the whole of the tendrils turned yellow (almost amber), with just that hint of turbidity which seems to be characteristic of *C. ambiens*, and it became obvious that no distinction worth having could be drawn between this form and what had been already accepted as a form of *C. ambiens* on the same host. This conclusion is strengthened by Saccardo's remark, of his specimens on *Acer* (p. 268) "basidia verticillato-ramosa, longiuscula." Other specimens previously called *leucosperma* on *Prunus Laurocerasus* were found to be similarly capable of falling under the inclusive *C. ambiens*, and for the same reasons. Original examples of Fries (Scler. Suec. no. 156) offer nothing that contradicts this idea.

Very possibly *C. hyalosperma* could be treated in a similar way, and in like manner *C. guttifera* will probably turn out to be merely a congeries of specimens in which, owing to the weather conditions, the gelatinous contents issued in the form of a globule instead of a tendril.

*C. microspora* Rab. (*Naemospora microspora* Cord.) stands on a different basis: it seems to be merely a mistake. Probably Corda had before him one of those cases, such as are to be met with, where the pustules of a *Cytospora* and of a *Naemospora* grew so close together that they merged into one. I have a twig of *Crataegus Oxyacantha* in which this is clearly shown, the dark stroma of *C. Oxyacanthae* penetrating into, and even being surrounded by, the bright orange stroma of *N. crocea* (Bon.) which is common on that host. The great similarity of the spores, in size, shape, and manner of growth, would help to confirm the illusion. *N. microspora* Cord. (Ic. iii. 26, f. 69) is in my opinion a "species" compounded of two fungi which accidentally grew merged together. The description of *C. microspora* previously given (p. 18) is that of Diedicke, and may represent a species but, I think, it is certainly not that of Corda, Desmazieres or Rabenhorst.

## Index of Hosts.

### Coniferae.

*C. Abietis*
*C. Curreyi*
*C. Friesii*
*C. Pinastri*
*C. Pini*
" var. *Taxi*

### Cupuliferae

Quercus.
*C. ambiens*
*C. ceratophora*
*C. guttifera*
*C. intermedia*

Alnus
*C. occulta*

Castanea
*C. ambiens*
*C. ceratophora*

Corylus
*C. ambiens*
*C. Fuckelii*

Betula
*C. ambiens*

Fagus
*C. ambiens*

## Salicaceae.

Salix
*C. Capreæ*
*C. fugax*
*C. germanica*
*C. Salicis*
*C. translucens*

Populus
*C. chrysosperma*
*C. Harioti*
*C. nivea*

## Ulmaceae

*C. ambiens*
*C. carbonacea*

*C. ceratophora*

## Aceraceae

*C. ambiens*
*C. annulata*

*C. hyalosperma*
*C. leucosperma*

## Rosaceae

Pruneae
*C. cincta*
*C. Laurocerasi*
*C. leucosperma*
*C. leucostoma*
*C. microstoma*
*C. Prunorum*

Pomeae
*C. ambiens*
*C. carphosperma*
*C. leucostoma*
*C. microspora*
*C. Oxyacanthae*
*C. rubescens*

Roseae
*C. ambiens*
*C. Hendersonii*
*C. leucosperma*
*C. rhodophila*
*C. Rosarum*
*C. Kerriae*

Rubeae
*C. ambiens*
*C. clypeata*

## Oleaceae

Fraxinus
*C. ambiens*
*C. pruinosa*

Jasminum
*C. Jasmini*

Ligustrum
*C. pruinosa*

Syringa
*C. Syringae*

## Caprifoliaceae

Lonicera
*C. Lonicerae*

Symphoricarpus
*C. Symphoricarpi*

Sambucus
*C. Sambuci*

Viburnum
*C. Lantanae*

| | | |
|---|---|---|
| Ampelopsis | - - | *C. Ampelopsidis* |
| Ailanthus | - - | *C. Ailanthi* |
| Euonymus | - - | *C. Euonymi* (*C. foliicola*) |
| Hedera | - - - | *C. foliicola* |
| Hippophaë | - - | *C. Hippophaes* |
| Hypericum | - - | *C. Hyperici* |
| Ilex | - - - | *C. Aquifolii* |
| Juglans | - - - | *C. juglandina* |
| Laurus | - - - | *C. Lauri* |
| Morus | - - - | *C. atra* |
| Palmae | - - - | *C. Palmarum* |
| Platanus | - - | *C. Platani* |
| Rhododendron | - | *C. subclypeata* |
| Rhus | - - - | *C. rhoina* |
| Sarothamnus | - - | *C. Sarothamni* |
| Staphylea | - - | *C. Staphyleae* |
| Tilia | - - - | *C. carphosperma* |
| Vaccinium | - - | *C. Vaccinii* |
| Vinca | - - - | (see *C. foliicola*) |

## II.—ISAAC BAYLEY BALFOUR.

The death of Sir Isaac Bayley Balfour, K.B.E., D.Sc., M.D., LL.D., F.R.S., which was recorded in the last number of the *Bulletin* for 1922, is an irreparable loss not only to Botanical Science but to all those who had been privileged to know him and understand his pre-eminent personality and his capacity for realising the really great problems in the world of science. As the son of a distinguished Botanist he inherited a taste for botanical science to which he added the experience of travel and observation, a medical training and a course of botanical studies in Germany, all of which combined with an outstanding attitude of mind enabled him throughout his life to take that larger view which made him one of the most, if not the most, efficient and comprehensive botanist of the Empire, "the friend and counsellor of all that is best in British Botany."

Isaac Bayley Balfour was the son of Dr. John Hutton Balfour, Professor of Botany in the University of Edinburgh (1845–1879) and was born in Edinburgh on March 31st, 1853. He received his early education at Edinburgh Academy and duly proceeded to the University where he graduated D.Sc. in the Department of Physical and Natural Science and also matriculated in the Faculty of Medicine.

In 1874, when he was only 21 and an undergraduate in the latter Faculty, he was selected to accompany the party which went out to Rodriguez to observe the transit of Venus and at this early age he showed full promise of his powers. One of his letters from Rodriguez was considered of such interest by Sir

Joseph Hooker that he communicated it to the Linnean Society, and his observations on the vegetation of the island were published in the Transactions of the Royal Society, vol. 168 (1879), p. 302.

Among the results of this journey may be mentioned a careful study of the genus *Halophila* (Trans. Bot. Soc. Edin., 1877–78), and a valuable monograph of the genus *Pandanus* (Journ. Linn. Soc. Bot. xvii.), a genus of considerable difficulty, based largely on his own observations in the field.

On his return he completed his graduation in Medicine taking the M.B. with Honours in 1877, and then proceeded to the Universities of Strasbourg and Würzburg to continue his botanical studies. In 1879, at the age of 26, he was appointed Professor of Botany in Glasgow, and in 1884 he was elected Sherardian Professor of Botany at Oxford, and in virtue of his office assumed the charge of the Oxford Botanic Garden.

"You sent me to Oxford" he wrote in one of his last letters to Sir W. T. Thiselton-Dyer, and during his short tenure of that office he quickly made his influence felt in reviving the neglected Botanic Garden, and no doubt we may trace back to his Oxford Professorship the development of that interest in Botanic Gardens which has resulted in his remarkable achievements at Edinburgh and placed him on the highest pinnacle of the science and practice of Horticulture. It must not be overlooked, however, that during his tenure of the Glasgow Professorship the main range of Plant houses at the Botanic Gardens was rebuilt and other notable improvements effected which showed his knowledge of the needs of plants and his keen interest in their successful cultivation.

In 1880 he visited the island of Socotra at the instance of the British Association and with funds supplied by that body, and the elaboration of the material he there secured, after a stay of about seven weeks on the island, occupied him fully for some eight years after his return. His systematic work on the flora of Socotra was only equalled by his investigations into economic questions, and he was able to determine the sources of such famous drugs as Socotrine Aloes (*Aloe Perryi*), Dragon's Blood of Socotra (*Dracaena Cinnabari*), known to Dioscorides, and the sources of Socotran Myrrh and Frankincense, whose botanical origin was uncertain. Nor should his discovery of *Begonia socotrana* Balf. fil., be forgotten, since from it have been derived a large variety of most valuable winter-flowering Begonias that now are one of the principal winter adornments of our conservatories. (Trans. Roy. Soc. Edin., Vol. xxxi., 1888.)

While he was at Oxford he rendered two services to Botany for which botanists owe him a lasting debt of gratitude. He was one of the founders of the Annals of Botany and the Editor from the start in 1887 until 1912. Dr. D. H. Scott, who was his colleague in the Editorship for almost 20 years, writes "I consider the Annals owed more to him than to anyone.....he worked all the financial business with the Press most successfully and also

all the plates and I found him the best possible senior partner .....He had an amusing habit of settling everything by telegram —often of surprising length ! ”

The partnership over the Annals worked with absolute smoothness, and the long series of volumes is a sufficient monument to the sagacity and business capacity of Balfour's leading share in the venture.

His other signal service to Botanical Science dating from his Professorship at Oxford was the editing and translating of the standard German Textbooks in various branches of Botany, the publication of which was undertaken by the Clarendon Press. This valuable enterprise was due in great measure to the initiative of Prof. Rolleston in the first instance, and the translation of Sach's textbook of Botany by A. W. Bennett and Sir W. T. Thiselton-Dyer in 1875 was the first fruits of Prof. Rolleston's suggestion. Bayley Balfour took up the task of continuing the work with characteristic energy and was not only responsible as General Editor for the translation of the other standard works which were published by the Oxford Press but also himself translated Goebel's great work on Organography (vol. i, 1900, vol. ii, 1905), and with Prof. P. Groom revised and edited the translation of Schimper's Plant Geography (1903), and he translated, also with Prof. Groom, Warming's “ Oecology of Plants ” published by the Clarendon Press in 1909.

In 1888 he left Oxford to succeed the late Professor Alexander Dickson as Professor of Botany in the University of Edinburgh, and was appointed King's Botanist for Scotland and Regius Keeper of the Royal Botanic Garden and, as did his father before him, held these posts for a period of thirty-four years until he retired in March last.

These thirty-four years at Edinburgh were indeed remarkable whether one regards his work as a great teacher of Botany or as a great Director of a Botanic Garden. As a teacher for a generation he occupied the foremost place among British botanists. His personal charm arrested the attention of his students and the lucidity and depth of his lectures ensured the maintenance of their interest and attention. Being, as he was, a penetrating observer of Natural History and a remarkably able experimental biologist, he added to all that was valuable in his earlier training the newer knowledge as it was developing and to which he himself was one of the most potent contributors.

His success as a teacher was perhaps due to that wide vision of his which he was able to impart to his students, and which enabled them to realise that botanical investigation and research, whether in the field, the class room or the herbarium, were a means to an end rather than the ends themselves.

And it was not only to the purely botanical students that he thus gave of his best from his vast storehouse of learning and experience “ matured by time and ripened by wisdom,” but to that great army of medical students who were stimulated,

especially in his later years, by his courses of lectures on such biological topics of the time as relate especially to the medical curriculum.

It was the strain of these large classes of students and his determined endeavour to give to them the best of himself that no doubt proved eventually more than his failing health could withstand. This, added to the strain of the war and the cruel personal loss which it brought him, wore out his strength and in the service of the science he loved so jealously he gave his life in sacrifice and counted himself happy in so doing.

Of his work and achievements as Regius Keeper of the Royal Botanic Garden it is to be hoped a full account will be written. At Edinburgh, as had been the case both at Glasgow and at Oxford, he entered on his Professorship to find a Botanic Garden in a dormant condition which thoroughly whetted his zeal for reform and improvement. He was thus led to create a Botanic Garden, which, when viewed in its many aspects and allowing for the limitations of the space, has not its equal in the British Empire if in the world. Of the greenhouses that Bayley Balfour found at Edinburgh in 1888, the old Palm House —now a Temperate House—and the stove, where Palms and Cycads are now housed, are the only ones that remain. The rest of the fine range of glasshouses, pits and frames are new and constructed in the best possible manner for the growing and display of the remarkable collection of plants he gradually amassed in the gardens.

His activities in reconstruction were equally marked as regards the buildings devoted to teaching, and the last addition to the comprehensive Botanical Institute which he planned and carried to completion was only finished in 1921, just before the meeting of the British Association when the new Laboratory was used for a demonstration of the newly-discovered Devonian fossil plants. His galvanising personality and constructive ability were equally displayed in the open and he entirely reorganised the outside garden. Professor F. O. Bower has so well described this work that we cannot do better than quote his words* :—

"The arboretum was absorbed. Trees 30 and 40 feet high were successfully moved on specially constructed waggons to fresh and suitable sites. The collections of woody plants were enriched, and the herbaceous ground reorganised. But beyond all, the rock garden was created anew on a magnificent scale. This was Balfour's special care. He himself nursed shy plants in favoured crannies on rich schistose soil carried down on his own shoulders from Ben Lawers. His joy in showing them was no less than the pleasure of those who understood the real meaning of his success. It may be said that in the rock garden the true Balfour stood before you. The enthusiastic lover of

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* The Glasgow Herald, Dec. 5, 1922.

plants in being: the practical physiologist in the open. His 'oecology' was superior to that usually so called, for it was not analytic only, but constructive. At the back of it all was the fact that as a boy he had passed through the potting sheds like any working gardener. No doubt he had absorbed from Sadler, the old curator, much ancient wisdom; but it was refined and extended by his own scientific and horticultural sense. This, combined with his selection of a highly qualified body of leading officials, won for the Edinburgh garden a special fame for growing shy plants. The cultivation in the garden is probably as good as any in Europe, and it has been carried into many new and experimental lines."

With all this activity in matters connected with the Botanic Garden proper, in addition to his heavy duties as Professor, he yet found time to carry out those researches in the domain of pure botany, both taxonomic, oecological and physiological, which alone would have shed lustre on his name and justified the title of "King's Botanist in Scotland."

His later systematic work dealt more especially with the genera *Rhododendron* and *Primula* and his critical investigations on these genera have given his name a permanent place in the annals of systematic study. His interest in the flora of S.W. China, on which vast subject he was the recognised authority, may have been the reason for his devotion to these complex genera, and their difficulty no doubt added a further incentive to their study. With the Primulas collected on the second Mount Everest expedition he was working just before his death, and it is due to his careful studies that we now understand so much of the relationship that exists between the flora of the Himalayas and South Western China.

Of his physiological work mention must be made of his experiments on the effects of freezing in seed germination and of his work on Propagation made available to students in his 'Masters' Lectures on plant propagation, published in the Journal of the Royal Horticultural Society (vol. xxxviii. pt. 3, 1913), which show how he brought his wide scientific knowledge to bear on the practical problems of Horticulture.

In the domain of Oecology he was keenly interested, and many years ago he wrote and had printed some sheets of biological notes on Scottish Plants. These were circulated to a few friends, but unfortunately never published, and were only the commencement of what was intended to be a comprehensive work.

He also had in contemplation an account of the development of Botany and Forestry in Scotland during the last fifty years, and much known only to him is now, alas, lost beyond recall. In this connection must be mentioned his keen interest in the proposals to establish an Alpine garden in the Scottish mountains, put forward by Mr. A. K. Bulley, and the attainment of his long-standing desire to obtain a suitable site for a great Rhododendron

garden on the west side of Scotland, which he achieved shortly before his retirement.

Of his plans for the future after leaving Edinburgh the following extract from a letter written on April 24th last to Sir W. T. Thiselton-Dyer is of great interest :—

"The new Keeper will have two interesting things to carry out. It was bad luck that I collapsed when the negotiations were on completion. Lord Airlie is allowing us to have the sanctuary of the Caerlochan Deer Forest in which to make an Alpine garden. Bulley is financing. The spot is ideal. How I wish we had such a place going to have taken you to it on one or more of your northern pilgrimages. The other business is—the Forestry Commission offered me as much area as might be necessary in one of their suitable forests for the planting of Rhododendrons. The one I had in view was on the west coast near Ben More. The Rhododendron planting will be quite within easy reach of Glasgow and should be very attractive. This action has, I am glad to say, stimulated the Glasgow Corporation to make more use of the extensive area that belongs to them along the shores of Loch Goil. All this to the good. But I hate to drop out of it just when success is achieved—and indeed but for the engineering of these schemes chiefly I should have bid my adieu at once on settlement after the war with the prospect of a good time in retirement from work. I am trying in bed to arrange papers for a completion of a history of the Edinburgh Botanic Garden—begun many years ago—from which if I achieve it I look for much pleasure and none greater than in the telling of what it owes to you."

This, as his friends well knew, meant that for him retirement rather than being a time of idleness was to have been one of strenuous work.

Much that he had already done remains unwritten, and it was the hope of Botanists that in his leisure he would have given us of his wide and deep knowledge, illuminated by his grasp of principle and mature judgment, in a treatise on the Flowering Plants which no living botanist could do with so masterly a hand. His Presidential address to the Botanical section of the British Association at Glasgow (1901), was but a foretaste of his unrivalled powers.

To the great regret of his friends the state of his health prevented him from accepting the invitation to serve as President of the Linnean Society in 1916, and this intimation caused them no little anxiety. The Society awarded him the Linnean medal in 1919 and expressed the wish that "he might long be spared to continue the work that has served its members as an example and encouragement." His death on Nov. 30th 1922 at Courts Hill, Haslemere, has, alas! taken him from us as a living personality, but his work remains, and all that he was will continue as an example and encouragement to those who strive to follow the high ideal he set before them.

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## III.—HENRY JOHN ELWES.

We are indebted to the Editors of the Gardeners' Chronicle for permission to use a very interesting obituary notice of Mr. Elwes which was written by Mr. F. R. S. Balfour and appeared in that journal on Dec. 2, 1922. Except for a few interpolations it is reproduced as originally written :—

In the death of Henry John Elwes on Nov. 26, 1922, at Colesborne, at the age of seventy-six, there passed away one whose name is well and widely known and a figure very familiar to all at Kew. To state that he was perhaps the greatest living traveller of the day, an authority second to no one in Europe on trees, a lepidopterist whose collections enrich our national museum at South Kensington, the author of what is still the authoritative work on Lilies—though published so long ago as 1880, and a big game hunter and ornithologist of great repute, by no means exhausts the list of his activities.

For nearly fifty years Elwes was a valued and regular correspondent of Kew and a generous contributor to the collections. His first gift to the establishment was one of fifteen herbaceous plants on July 18, 1872; his last on August 5, 1922.

After leaving Eton Elwes spent five years in the Scots Guards, but the spirit of adventure which was strong in him to the end caused him to resign his captain's commission and begin that life of scientific travel and adventure from which such a rich harvest has resulted. His journeys were made in Turkey, Asia Minor, Tibet, in India four times, in North America and Mexico three times; in Chile; in Russia and Siberia three times; in Formosa, China and Japan twice; in Nepal and Sikkim. He was the official representative of Great Britain at the Botanical and Horticultural Congresses at Amsterdam in 1877, and at Petrograd in 1884. He was the Scientific member of the Indian Embassy to Tibet in 1886. Few, if any, men knew every country of Europe so well as he, and he greatly benefited by his excellent knowledge of French and German. For nine years Elwes was a member of a wild-boar shooting syndicate in the Ardennes, and he stalked chamois regularly in the Austrian Tyrol.

He was a past president of the Royal English Arboricultural Society, and of the Entomological Society of London; past vice-president of the Royal Horticultural Society, and a Victoria Medallist. In 1921 he was elected president of the British Ornithological Union, having been a member for 55 years. In 1897 the Royal Society elected him a Fellow.

Elwes' first publication appeared in the *Ibis* of 1869, the subject being "The Bird Stations of the Outer Hebrides." Four years later, in June, 1873, he published in the Proceedings of the Zoological Society his paper "On the Geographical Distribution of Asiatic Birds," his most important contribution to Ornithology, and to it he attributed his subsequent Fellowship of the Royal

Society. In 1880 his great monograph on the Genus Lilium appeared, a book which has long been out of print, but is still the recognised authority on the subject. From 1880 to 1906 he published 27 papers on the lepidoptera of many regions, and described numerous new species of his own finding. In 1888 there appeared in the Transactions of the Entomological Society his "Lepidoptera of Sikkim," a very valuable record of the numerous species of that country. He was in Formosa in 1912, and succeeded in bringing home alive several specimens of the splendid Mikado Pheasant.

Elwes' botanical discoveries in all the countries he visited were very numerous, and he introduced many species. None of these in recent years have aroused greater interest than the two Southern beeches, *Nothofagus obliqua* and *N. antarctica*, which he introduced from Chile in 1902. Both had been previously in cultivation but had disappeared from gardens almost entirely. The School of Forestry at Cambridge has greatly benefited by his munificence, and owes many of its finest timber specimens to him. In 1900, with his friend, Prof. Augustine Henry, as collaborator, Elwes began the preliminary labours which resulted in the production of that monumental work, *The Trees of Great Britain and Ireland*. The first of the seven volumes appeared in 1906, and the last in 1913. Never before has a book on European trees been attempted on such a scale, and with so lavish an expenditure of money in its preparation. Indeed, it can only be compared with Sargent's *Sylva of North America*, that great fourteen-volume record of American arborescent species. Elwes especially undertook the task of visiting every place in this country where remarkable specimens exist, as well as every European collection of note. The number of trees described which Elwes himself had seen and measured is overwhelming evidence of the untiring zeal he devoted to this work, well-nigh impossible except to one in whom the boyish spirit of adventure survived. The fact that both he and Henry had seen almost every species in its native land gave great additional value to their descriptions of the cultivated plants. Never was a great labour more fittingly divided, Elwes making incessant journeys to see and take particulars of specimens, and Henry, the exact botanist, writing the scientific descriptions. To the writer the ubiquitous character of their researches was vividly brought home when in 1917, during war service in France, he had occasion to visit a little known property in the Médoc. He saw there some remarkable Oaks, Pines, and other trees of the S.E. United States, grown from seeds sent home by Michaux 100 years ago. Though the existence of these trees was scarcely known in France, the proprietor stated that a few years previously two gentlemen had come from London to see them, a Monsieur Elwes and a Monsieur Henri! Some twelve years ago the writer paid a visit to Grasse, in the Riviera, on the business of a public company; Elwes accompanied him solely to see two individual

natural hybrid Oak trees which he believed could be found within a few miles of that place. It is needless to add that the two trees were duly found and photographed on the very day following that of arrival! This is not the place to describe the great book in detail or enlarge on what it has meant for arboriculturists generally. Its scientific accuracy, expressed in plain, straightforward and admirable English, has given an incalculable impetus to forestry and arboriculture in this country, and has inspired with enthusiasm everyone fortunate enough to possess it. Elwes indeed, had a ready pen, and was master of an easy, vigorous style rarely surpassed in botanical literature. No slip-shod statement of fact or hearsay evidence would satisfy Elwes' critical faculties; indeed, there are some who think he at times expressed his dissent with needless emphasis. He had little knowledge of the arts of compromise or how to agree with his adversary in the way. When in pursuit of a subject he sometimes urged his views on his hearer without giving him an opportunity to express his own, a failing not uncommon in those of masterful intellect in whom the sense of humour is, perhaps, somewhat deficient. He had difficulty in realising the point of view of others; no one was more ready to acknowledge their achievements in his publications, but the judgments he expressed of the character of men, or the merits of plants, were sometimes precipitate and prejudiced. A charming characteristic was his readiness to admit when he was wrong, and he combined a chivalrous courtesy with a self-assertiveness which those who did not know him well were apt to misjudge. It was only when one had got to know him thoroughly that one appreciated the real charm and lovableness of his character. No sketch of Elwes' life should omit mention of his amazing powers of assimilation of knowledge and of his prodigious memory. He seemed to absorb information through his faculties of vision—both of books and of things—rather than by listening to the spoken word.

As a West Country squire the handsome, burly figure of Elwes was well known, in the hunting field and elsewhere, among his more stay-at-home neighbours. His estate of Colesborne in the Cotswolds is, unfortunately, situated for the most part on the cold oolitic formation of that district, and he deplored, as indeed we all may, that he possessed no acres of green-sand or old red sandstone on which to make his plantations and pinetum. In a frosty valley near his house he formed a "Centenary Plantation" of trees of many species grown from seed collected mostly in this country in 1900, a year remarkable for the ripening of tree seeds of all kinds. Here careful temperature and other records have been kept, and the origin of the trees in each plot is known. It was a delight to Elwes to show his guests the results, and he was as much interested in, and as careful to point out, the failures as the successes. Truth to tell, the former were almost as numerous as the latter. In his garden, however,

he was more fortunate. His glass-houses were full of plants rarely seen elsewhere in cultivation, many of them introduced by himself.

In 1890 his friend Max Leichtlin gave him his collection of South African Nerines. Elwes grew these successfully ever since, and did more than anyone else to improve them by hybridisation. In recent years he took a keen interest in the cultivation of succulent plants, and succeeded remarkably with many species of *Mesembryanthemum*, *Haworthia*, and other desert species. For many years his garden contained a fine collection of bulbous plants; in 1874 he discovered six new Crocuses in Asia Minor, and ever since, with many species of Fritillary, Tulip, and Snowdrops, they have flourished at Colesborne. He had always taken a keen interest in Alpine plants, and near the end of his life contemplated writing a book on these at a time when most of his friends would have preferred him to devote all the energies of his declining years to an autobiography.

Colesborne was a museum of his collections of butterflies, big-game trophies from all countries, and his remarkable collection of timbers, and what he could tell about them, rendered a visit to Colesborne an experience none of his friends will forget. In recent years he devoted much time to the bringing together at Colesborne and the hybridising of sheep of primitive breeds from all parts of these islands, and published an interesting paper about them. He sent pens of these sheep to the Royal Agricultural Show at Bristol in 1913. The qualities of various wools induced him to take up this subject, and from what they learned at Colesborne many have started flocks of their own, and go clad, as he did, in cloth of "Moorit" Shetland, or Black Welsh of their own raising.

Elwes succeeded to Colesborne on the death of his father in 1891. He was the eldest of a family of seven. One of his sisters married, as his first wife, Sir Michael Hicks Beech (afterwards Lord St. Aldwyn), and another was the first wife of the late Frederick du Cane Godman, F.R.S., who shared all of Elwes' botanical and zoological interests, and was his greatest friend. A story Elwes was fond of telling was of when in the 'seventies he and Godman were on a coach on the way to the Yosemite Valley in California. They were sitting on a back seat and named to each other every butterfly and tree they passed. The driver was becoming more irate every minute at hearing two "tenderfoot" Britishers identify things of which he knew nothing, unless it was the occasional local name. On coming to a tree of *Fremontia californica*, covered with its yellow blossoms, the lady at his side asked what it was. "I call it Slippery Elm," was his reply, "but I don't know what the pair of bug-fiends back of me will say it is!"

Elwes was at his best in his own home. An admirable host, he imparted information to his guest on all scientific subjects,

with such kindly insistence, that even the most indifferent could not fail to catch his enthusiasm.

He married in 1871, Margaret Susan, the second daughter of the late W. S. Lowndes-Stone, of Brightwell, in Oxfordshire, who, with an only son, Colonel Henry Cecil Elwes, D.S.O., M.V.O., survives him.

Amongst scientific men now living none perhaps had a longer or more intimate acquaintance with Elwes than Sir William Thiselton-Dyer, who became Assistant Director of Kew in 1875 soon after Elwes entered into relationships with the establishment. We are indebted to him for the following communication :—"It is just half a century since I made Elwes's acquaintance when he was a young subaltern in the Scots Guards and I have always thought, at that time, the handsomest man I had ever come across."

"His main life-work lay amongst Birds and Lepidoptera. He was drawn to Botany through horticulture and arboriculture, but never acquired a technical knowledge of Botany. The botanical part of the Monograph of Liliums was done by Baker and the scientific side of 'The Trees of Great Britain and Ireland' was the work of Augustine Henry. But Elwes on his part spared neither time, labour nor expense in the effort to attain accuracy in the matters of fact. For instance he went to Busaco in Portugal in 1909 solely to investigate the history of the so-called 'Cedar of Goa,' *Cupresses lusitanica*, which had been introduced from Mexico."

"His paper in 1873 'On the Geographical Distribution of Asiatic Birds' is an important landmark in the literature of Distribution. I quote what I have stated in my article on 'Distribution of Plants' in the eleventh edition of the Encyclopædia Britannica" :—

"Of the vegetation of China till recently very little has been known. In 1873, Elwes pointed out (in the paper cited above) that the Himalayan avifauna extended into North-west China and established the Himalayo-Chinese subregion. Shortly afterwards the collection of Prejewalsky confirmed it for the flora. And we know that, excluding the southern tropical area, it has the same character throughout the whole of China proper. We may therefore regard the Himalayan flora as a western extension of the Chinese rather than the latter as a development of the former."

"I well remember Sir Joseph Hooker's excitement when he heard of Prejewalsky's discovery.* It is not surprising that Elwes paid four visits to India and two to China. His establishment of the Himalayo-Chinese region for birds would have alone secured his election to the Royal Society if his achievements in entomology had not also earned it."

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* *See* Thiselton-Dyer, Proc. Roy. Geog. Soc. 1878, on Plant Distribution, and *Mongolia*, Prejewalsky. Translated by E. Delman Morgan, 1876; vol. ii. pp. 85, 87.

"The names of Hooker, Elwes, Bayley Balfour and Prejewalsky will always be inseparably associated with the Himalayo-Chinese region."

Mr. Elwes's intimate association with the Botanical Magazine began in 1875 and continued to the last days of his life. It is not unfitting to note here that largely through his generosity and by his active interest this venerable publication, after a short lapse, has now been launched again on what we all hope will be another century of unbroken prosperity and even greater usefulness. The recently issued part contains a new *Aeschynanthus* from his collections, and several plates in the parts now in the press were prepared from material furnished by him. He had a particular wish that the number of his plants figured in the Magazine should reach a hundred, and it was a great satisfaction to him to know that during this past year the century was attained. In July last he wrote: "I believe I am right in saying that no private garden has contributed so many species to the Botanical Magazine." So long ago as 1877 Sir Joseph Hooker dedicated a volume to him, "an honour," he declared, "which at such an early period I did not deserve." Sir Joseph's fine tribute to the zeal, intelligence and success with which Mr. Elwes had pursued horticultural botany, and to the liberal spirit in which he had laboured to advance its best interests, might have been expressed not only with reference to what he had so far accomplished, but what one having a knowledge of his character and talents might have expected from him during his subsequent life.

A glance at the list of plants which Elwes contributed to the Botanical Magazine reveals the fact that nearly all are herbs, and that rather more than two-thirds of them are petaloid monocotyledons. Many were collected by himself, and chiefly during his travels in Northern India, the Near East, South America and Formosa, a great number being new introductions not a few of which have become garden favourites.

In the issue of the Magazine for May 1, 1875, two of the five plants figured—*Crocus chrysanthus* (t. 6162) and *Galanthus Elwesii* (t. 6166)—were from Elwes, and these were the first of his contributions to the publication. The fine Snowdrop was first collected by Balansa in 1854, and dried specimens were distributed under the name of *Galanthus plicatus*. Elwes introduced it into English gardens twenty years later from the mountains near Smyrna, and was the first to point out its distinctive characters.

Among the plants which Elwes supplied for the Botanical Magazine, the following, arranged in families as in Bentham and Hooker's Genera Plantarum, deserve particular mention: Three fine species of *Corydalis*, *C. Sewerzovii* (t. 6896) and *C. Kolpakowskiana* (t. 6925), from Western Turkestan, and *C. Ledebouriana* (t. 6946), from Soongaria; *Tricuspidaria dependens* (t. 8115), of which Elwes brought home seeds from Chile

in 1902; the beautiful *Oxalis adenophylla* (t. 8054), also from Chile; *Deinanthe caerula* (t. 8373), a new species of a small genus of *Saxifragaceae* from Central China, introduced by E. H. Wilson and first flowered in this country at Colesborne; *Caiophora coronata* (t. 8125), a Loasaceous plant with large white flowers, re-introduced from the Argentine side of the Andes in 1902; *Cereus amecamensis* (t. 8277), a fine Mexican species with large white flowers, a plant of which Elwes presented to the Kew collection; though he was much interested in the family this is the only Cactaceous plant received from him for the Magazine; the handsome *Aster diplostephioides* (t. 6718), with flower-heads 2–3 inches across, seeds of which were collected in Sikkim; *Shortia galacifolia* (t. 7082), a lovely plant concerning which Sir Joseph Hooker wrote :—"The credit of flowering it for the first time in England is due to our indefatigable correspondent, Mr. Elwes"; *Primula prolifera* (t. 6732), another introduction from Sikkim, "which had long been regarded as a desideratum"; the singular *Castilleja miniata* (t. 8730), from North-West America, where it was collected by Mr. F. R. S. Balfour; three rather striking *Labiatae*, namely :—*Dracocephalum speciosum* (t. 6281), raised by the Rev. H. Harper Crewe, from Elwes's Sikkim seeds; *Phlomis spectabilis* (t. 8870), a handsome large-leaved plant with rose-purple flowers, from Kashmir; and *Salvia brevilabra* (t. 8848), one of Messrs. Veitch's introductions from Western China, and *Nothofagus antarctica*, var. *uliginosa* (t. 8314).

The large proportion of petaloid monocotyledons among Elwes's Botanical Magazine plants has already been mentioned. About a fifth of the whole number belong to the *Orchidaceae*, and with few exceptions all the Orchids are terrestrial species. These include : *Arethusa sinensis* (t. 7935), from Western China; *Brownleea caerulea* (t. 7309), from South Africa; *Calanthe tricarinata* (t. 8803), from Northern India, Yunnan, and Japan; two fine species of *Chloraea* (tt. 7955 and 8100), tubers of which Elwes brought home from Chile and presented to Kew; the pretty *Coelogyne* (*Pleione*) *Hookeriana* (t. 6388), from Sikkim; *Cypripedium montanum* (t. 7319), from California, and the beautiful *C. guttatum* (t. 7746), from the Altai Mountains; two species of *Disa* (tt. 6529 and 7403), from South Africa; *Habenaria Elwesii* (t. 7478), from the Nilghiri Hills; and the remarkable *Serapias papilionaceolingua* (t. 6255), from Southern France.

The *Scitamineae* are : *Alpinia Elwesii* (t. 8651), an attractive plant obtained in Formosa; *Hedychium gracile* (t. 6638), from the mountains of Northern India; the splendid *Kaempferia Kirkii*, var. *elatior* (t. 8188), from Rhodesia; and *Zingiber Mioga* (t. 8570), a Japanese species.

Among *Iridaceae* are four charming Crocuses, *C. chrysanthus* (t. 6162), *C. Crewei* (t. 6168) *C. Fleischeri* (t. 6176, ff. 5–7) and *C. Boryi* (t. 6187) for the introduction of which we are indebted to Elwes; all were collected by himself in Greece or Asia Minor.

*Gladiolus Ecklonii* (t. 6335), is a distinct and beautiful Cape species. The four Irises contributed include *I. cretensis* (t. 6343), from Greece, Asia Minor, &c., and the magnificent *I. Lortetii* (t. 7251), a Syrian species.

In *Amaryllidaceae*, besides *Galanthus Elwesii* already alluded to, there are an *Agave* (t. 8429), a *Bomarea* (t. 6444), and *Hippeastrum Elwesii* (t. 8614), discovered by Elwes in Argentina.

Elwes's studies of the genus *Lilium* have a lasting memorial in his splendid Monograph of the genus, published in 1880. He was deeply interested in many genera of the family, and altogether twenty-four species, representing ten genera, were contributed by him to the Magazine. Of these may be mentioned *Chionodoxa nana* (t. 6453), *Colchium Troodii* (t. 6901), five species of *Fritillaria* (tt. 6321, 6371, 6385, and 7080). *Kniphofia comosa* (t. 6569), *Muscari aestivale* (t. 6269), and eight Tulipas, these including *T. Eichleri* (t. 6191), *T. Alberti* (t. 6761), and *T. Kaufmanniana* (t. 6887), which are particularly fine species. Some years ago Elwes contemplated a monographic work on the genus *Tulipa*, and it is much to be regretted that he was unable to proceed with it. He was also attracted by the Arisaemas, three species of which, including the remarkable *A. Griffithii* (t. 6491), from the Eastern Himalaya, are among his contributions to the Botanical Magazine.

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## IV.—MISCELLANEOUS NOTES.

Lieut. S. M. Gilbert, B.Sc. (Agric.), and Lieut. C. J. Lewin, M.C., have been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Superintendents in the Agricultural Department, Nigeria.

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Mr. E. F. L. Shepherd has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Botanist and Mycologist, Mauritius.

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Captain E. G. Staples has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a District Agricultural Officer, Uganda.

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Mr. E. A. Walters, formerly Field Assistant, Chemical Research Department, Kenya, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Agricultural Superintendent, St. Lucia. (See also *K.B.*, 1921, p. 30.).

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**Visitors during 1922.**—The number of visitors to the Gardens in 1922 was 1,143,758.

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**Garden Operations, 1922.**—Roses. The formal arrangement of beds and clipped hollies south-west of the Palm House was designed by Nesfield and made about 1850. It has ever since been devoted to what used to be known as 'American Plants,' shrubs belonging mostly to the *Ericaceae* and *Vacciniaceae*. The site is low-lying, cold and damp, and plants growing there are very subject to injury by late spring frosts. For this reason many of the shrubs did not succeed and had to be constantly renewed and the general effect was never satisfactory. As all the species grown there are represented in other parts of the gardens, and were not needed for collection purposes, it has been decided to remove them and to transform the area into a Rose garden pure and simple. For many years the marginal beds near the holly hedge have been planted with roses, and these, thriving very well, have been a source of great pleasure to visitors. Considering the extent of Kew and the predominant place roses fill in purely ornamental horticulture at the present time, it was felt that the giving up of this additional area was justifiable. The design has been slightly altered and some of the beds reduced in size. During the past autumn about half the beds have been prepared by thoroughly trenching the ground and by the addition of new soil. These are now planted with varieties which our own experience and that of rose experts suggest will succeed. It is proposed to deal with the remainder of the area next autumn.

The Collection of Hollies. A considerable extension of the area devoted to this collection has been made during the past autumn. Hitherto the hollies have been planted at each side of the long straight gravel path known as the Holly Walk. This was made in 1874 and is of historical interest as traversing part of the Love Lane of olden times—a bridle path which ran from Richmond Green to the Horse Ferry over the Thames at Brentford. It was also the original dividing line between the old Kew Gardens and Richmond Gardens. As so frequently happens in avenue planting, the hollies were not originally allowed sufficient space to develop fully and they have to be pruned at the side occasionally to keep them from encroaching on the path. There are, however, some very fine specimens amongst them, especially considering the poorness of the soil in which they grow. A new double avenue leading from the steps of the Temperate House across the lawn towards the wood has been made, and others have been planted at the sides of the diagonal walks leading from the same steps.

Medicinal and Economic Plants. A new arrangement of beds for this group of herbs has been made in the garden of Cambridge Cottage, near No. IV. Museum. The design is purely geometrical and is on the lines of the old "Physic Gardens" still to be seen at Padua and other ancient foundations.

The effects of the extraordinary drought of 1921 are still being severely felt. Several old beeches have died and had to

be uprooted and, judging from the poor growth and small leaves produced by many others during 1922, it seems probable that the tale of losses is far from being complete. Although the weather during the latter part of May and early June was hot and dry, the summer on the whole was dull, cool and damp, but the total rainfall has not been quite up to the average, nor has it sufficed to moisten the ground through. In many places it was still, in early December, dry and caked at depths of two to three feet.

Nor is it certain how much the salt water from the Thames (see *Kew Bulletin*, 1922, pp. 13-15) is still affecting the vegetation. Many of the rhododendrons both out of doors and in the Himalayan House have the growth of the past summer scorched and poorly developed. But with the hardy ones at least it is possible that this may in part be due to the after effects of the drought.

It is many years since so plentiful a crop of fruit was produced on hardy trees and shrubs at Kew. Nothing was finer than the common pyracanth (*Pyracantha coccinea*). Judging from our experience at Kew this shrub is not sufficiently grown as a shrub in the open ground, being nearly always planted against a wall, where of course it is also very handsome. But it is perfectly hardy and fruits freely without any wall protection, as a group of the species near the Rock Garden shows. This autumn they were covered from top to bottom with scarlet fruits. Cotoneasters, thorns, whitebeams, mountain ashes, and barberries were all exceptionally good.

The inside of the Aroid House (No. 1) was repainted and some of the woodwork renewed. The interior of the Himalayan House was also repainted.

Thanks in a great measure to the magnificent gift of Orchids by Sir George Holford (see *Kew Bulletin*, 1922, p. 155), there was a very fine display of Cattleyas and Laelias in the Orchid House in late autumn—unfortunately cut short by the November fogs.

One of the most interesting plants which flowered during 1922 was *Pachira macrocarpa*, a native of Mexico, of which there is a fine tree in the Palm House. It is a curious member of the Mallow Family. Some of the flowers developed fruits.

Three special exhibitions were arranged during the year. One illustrating the development of the modern garden varieties of Petunia, another showing the wild tuberous Begonias from the Andes and their modern decorative derivatives, and the third the winter-flowering Begonias of the Gloire de Lorraine type resulting from the cross between *B. Dregei* and *B. Socotrana* and the hybrids between the latter and the tuberous Andean varieties.

Additions to Gardens, 1922. The number of separate consignments of living plants, seeds, etc., to the Gardens was 465. The most important were the following :—

Aberdeen University Botanic Gardens.—*Barleria siamensis*; seeds of *Widdringtonia Whytei*.

Cambridge Botanic Garden.—Various seeds and plants.

Edinburgh, Royal Botanic Garden.—297 packets of seeds collected by Mr. George Forrest.

Glasgow Botanic Gardens.—Collection of Filmy Ferns, etc.

Glasnevin, Royal Botanic Gardens.—Collection of Pelargoniums, *Crassula rubicunda* miscellaneous Stove and Greenhouse plants, hardy trees and shrubs.

Royal Botanic Society, Regent's Park.—*Aloe plicatilis*, *Crinum pedunculatum*.

R.H.S. Gardens, Wisley.—Collection of new Chinese trees and shrubs.

Arnold Arboretum.—Many packets of seeds, bulbs of *Lilium amabile*, and numerous hardy trees and shrubs.

Antigua Botanic Garden.—*Cacti*.

Bangalore Botanic Garden.—Bougainvilleas.

Calcutta Royal Botanic Garden.—Tubers of *Amorphophallus campanulatum*, seeds of *Dendrocalamus sikkimensis*.

Darjeeling Botanic Garden.—Large collection of seeds.

Dominica Botanic Station.—*Utricularia spp.*, species of *Lycopodium*, orchids and ferns.

Kirstenbosch National Botanic Gardens, Cape Town.—95 packets of seeds, South African plants.

Kumaon Botanic Gardens.—Collection of ferns and orchids; seeds of *Holmskioldia sanguinea*.

Malta, Dept. of Agriculture.—*Urginea maritima*.

Mozambique, Dept. of Agriculture.—Crinums.

Nairobi Forestry Dept.—Seeds *Cassia Beareana*, *Acokanthera longiflora*, *and* other African plants.

Nigeria, Dept. of Agriculture, Ibadan.—Seeds of *Elaeis guineensis*, vars.

Ootacamund Botanic Garden.—Wardian cases of Orchids, seeds, etc.

Ceylon, Dept. of Agriculture.—Seeds of Tea plant, *Hevea brasiliensis*, etc., Wardian case of Orchids.

Sierra Leone, Dept. of Agriculture.—Seeds of *Oryza Barthii*.

Singapore Botanic Garden.—Collection of Stove plants, including species of *Dioscorea*.

Sydney Botanic Garden.—Seeds and tubers of Australian plants.

Trinidad Royal Botanic Garden.—*Zephyranthes Eggersii*.

Uganda, Department of Agriculture (Mr. J. D. Snowden).—Collection of Orchids.

Washington, U.S. Dept. of Agriculture.—Various new species of economic and other plants.

Mr. A. C. Bartholomew, Reading.—Herbaceous plants and seeds.

Mr. F. R. S. Balfour, Dawyck.—Seeds of Chilean plants, etc.

Mr. H. Clinton Baker, Bayfordbury.—Orchids from Zanzibar.

Mr. R. N. Beamish.—*Embothrium coccineum*,

Lt. Gen. Sir A. G. F. Browne, Farnham.—*Dendrobium arachnites*, *Sarcanthus filiformis*.

Mr. T. H. Burroughes, Wroxham.—*Rosa Ecae*. Herbaceous plants.

Mr. W. H. Charlton, Shepherd's Bush.—Collection of Succulents.

Mr. L. Chenault, Orleans.—Rare Chinese trees and shrubs.

Major W. F. Chipp, Simla.—Seeds and lily bulbs.

Mr. H. Correvon, Geneva.—Seeds of Alpine plants.

Mr. R. Cory, Cardiff.—Seeds (272 packets) collected by Mr. George Forrest; seeds of *Magnolia parviflora*.

Mr. C. Coutts, Newton Poppleford.—Bulbs and seeds of *Lilium regale*.

Mr. M. T. Dawe.—Seeds, bulbs and tubers from Belgian Congo Territory and Portuguese West Africa; seeds of *Melinis minutiflora*.

Sir Hugh Daly, Ryde.—Indian plants.

Lt. Col. F. R. Durham, Kew.—Seeds and plants from Gallipoli.

Lady Thiselton-Dyer.—*Sedum Winkleri*.

Mr. C. Eley.—7 packets of Azalea seeds.

Mr. H. J. Elwes (late).—Collection of Succulent plants, including *Pelecyphora pectinata*, *Runyonia tenuiflora*, also various seeds and bulbs.

Mr. R. Fox, Penjerrick.—Rhododendrons.

Mr. J. S. Gamble, East Liss.—Bamboos, Himalayan plants and seeds.

Mr. R. H. Graham, Belgian Congo.—Seeds "Efwatakala grass" (*Melinis minutiflora*).

Hon. Vicary Gibbs, Aldenham.—Numerous hardy trees and shrubs, and herbaceous plants.

Mr. A. Grove.—*Lilium Leichtlinii*.

Mr. W. F. Hamilton, Pylewell Park, Lymington.—25 Chinese Rhododendrons.

Commendatore C. Hanbury, La Mortola.—105 packets of seeds.

Mr. F. J. Hanbury, East Grinstead.—Herbaceous plants and seeds.

Capt. J. F. Harrison, King's Walden Bury.—Collection of Calanthes, Begonias, etc.

Marquis of Headfort.—*Pieris taiwaniana*, *Deutzia taiwaniana*, Chinese Rhododendrons.

Prof. J. Henriques, Coimbra, Portugal.—Bulbs, *Narcissus scaberulus*.

Prof. A. Henry, Dublin.—Seeds of *Larix* and *Widdringtonia*.

Mr. A. Hislop, Rhodesia.—Collection of S. African orchids, etc.

Sir George Holford.—Collection of Orchids (see note in *Kew Bulletin*, 1922, p. 155).

Mr. E. M. Holmes, Sevenoaks.—Seeds of medicinal plants.

Mr. M. Hornibrook.—Collection of dwarf conifers.

Mr. J. Hutchinson, Kew.—23 packets seed of Pyrenean plants.

Emir of Katsina.—Collection of Nigerian seeds.

Dr. Kerr, Bangkok.—Tubers, *Amorphophallus*; seeds, *Styrax* sp.

Mr. C. H. Lankester.—Bulbs and seeds from Upper Soudan; plants of *Guilielma utilissima* and fern spores from Costa Rica.

Mr. G. W. E. Loder.—Hardy trees and shrubs.

Lady Loder (late), Leonardslee.—Large plant of *Rhododendron Loderi*.

Capt. H. Lynes, R.N., Khartoum.—Seeds and bulbs from Sudan.

Mr. E. L. P. Magor, Lamellen,—Seedlings of Chinese primulas, Rhododendrons, etc.

The O'Mahony, Coolballintaggart.—Herbaceous plants.

Miss M. H. Mason, Cape Town.—Tubers of South African *Oxalis* and various seeds.

Mr. J. A. McPherson, Kew.—Collection of New Zealand seeds.

Lt. Comm. J. G. Millais, Horsham.—Rhododendrons.

Mrs. M. T. Mitford-Barberton, Kenya Colony.—Orchids.

Sir Daniel Morris.—Seeds of *Melhania erythroxylon*.

Mr. W. Nelson, Transvaal.—*Mesembryanthemum Nelsoni*.

Mr. R. Lloyd Praeger, Dublin.—Collection of Sempervivums.

Col. D. V. Pirie, Savennières.—Seedling bulbs of *Lilium candidum*.

Mr. W. R. Price, Chepstow.—*Juniperus morrisonicola*.

Mrs. Read, Milford.—Seeds collected by Forrest in W. China.

Mrs. Roberts, Barnes.—Orchids.

Mr. F. M. Rogers, Tanganyika Territory.—88 packets of seeds and Wardian case of plants.

Mr. L. de Rothschild, M.P.—Nymphaeas, Chinese Rhododendrons and other trees and shrubs.

Mr. C. E. Salmon, Reigate.—Saxifrages, etc.

Mr. H. Sclater, Bow.—Collection of succulents, including *Mesembryanthemum fulviceps*.

Mr. Slocock, Woking, Hardy trees and shrubs, including a collection of Chinese *Enkianthus*.

Count Hoyos Sprinzenstein, Austria.—Collection of Tyrolese plants.

Dr. Stephanoff, Sofia, Bulgaria.—73 packets seeds.

Mr. T. P. Stokoe, Cape Town.—Seeds of South African heaths, etc.

Mr. T. A. Stevenson, Sevenoaks.—British Orchids.

Mr. G. Thorncroft, Barberton, S. Africa.—Seeds, bulbs, etc., South African plants.

Mrs. J. A. Tracey, Bogota.—Pita plants.

Prof. R. S. Troup, Oxford.—19 packets of seeds from Kenya Colony.

Mr. W. B. Turrill, Kew.—191 packets of seeds collected in the Balkans.

Mr. P. C. M. Veitch, Exeter.—*Magnolia Veitchii*, and other trees and shrubs.

Messrs. Vilmorin-Andrieux, Paris.—Seeds collected in China by M. Hers.

Mr. F. Kingdon Ward (per Mr. Euan Cox).—169 packets of seeds collected in Chinese Tibet.

Mr. W. T. Webster.—Aquatic plants.

Mr. J. C. Williams, Caerhays.—Numerous seeds and seedlings of Chinese Rhododendrons.

Miss M. Wilman, Kimberley.—South African Plants.

Miss E. Willmott, Warley.—Pelargoniums, etc.

Mr. G. Dent Young, Nigeria.—Seeds of *Dopatrium longidens*.

Sir F. Younghusband (Mt. Everest Expedition, 1922) plants of *Sedum sp.*, seeds *Sophora Moorcroftiana*.

Surplus plants from the collections were distributed as usual, either in exchange with botanic gardens, nurserymen, and regular correspondents or as gifts to various teaching institutions, and there was the usual distribution of seeds produced by the cultivated plants; the total number of packets thus distributed was 2533 of hardy trees and shrubs, and 2466 of hardy herbaceous plants. The most important of the seeds obtained for special distribution were: *Canella alba, Oryza Barthii, Melinis minutiflora* f. *inermis, Abies Forrestii, Dendrocalamus sikkimensis, Picralima Klaineana, Fraxinus micrantha, Vitis rugosa*.

The recipients of plants, etc., from Kew, included the following:

Birmingham Botanic Garden.—Greenhouse plants.

Bloemfontein Public Parks.—Cuttings of poplars, willows, and tamarisks.

Cambridge Botanic Garden.—Trees, shrubs and cuttings.

Lord Clinton.—Cuttings of poplars.

Director of State Forest Service, Rotoroa, New Zealand.—Cuttings of Willows, etc.

Hon. Vicary Gibbs.—Trees and shrubs, herbaceous plants.

Glasnevin, Royal Botanic Garden.—Nymphaeas, Sempervivums, etc.

Mr. C. Hanbury.—Mesembryanthemums, etc.

Imperial War Graves' Commission.—Cuttings, trees and shrubs.

Imperial War Graves' Commission (New Zealand Section).—67 New Zealand Veronicas, Senecios and Olearias.

Liverpool Corporation.—Seeds of *Davidia, Æsculus indica, Quercus Mirbeckii*.

Mr. F. E. Marshall, Keswick.—58 trees and shrubs.

Municipal Buildings, Aldershot.—2000 cuttings of trees and shrubs.

School of Forestry, Oxford.—Collection of Conifers.

Pomological Institute, Troja, Czecho-slovakia.—Grafts of 94 kinds of *Prunus* and *Pyrus*.

Mr. R. Lloyd Prager.—100 species of *Sempervivum*.

Regent's Park.—20 trees and 100 *Anchusa italica*.

Soldiers' and Sailors' Association, Wimbledon.—150 shrubs.

United States Dept. of Agriculture.—Seeds and cuttings of *Davidia spp.*

Miss E. Willmott.—Rhododendrons and Pelargoniums.

Windsor Castle.—Trees and shrubs.

Purchases of importance :—Cacti collected by C. R. Orcutt, La Jolla, California, in Lower California and Mexico, including a large *Cereus giganteus*, weighing over half a ton and measuring ten feet six inches in height and fifty-one inches in circumference.

At an auction sale of plants of the late Mr. Elwes, some rare orchids and other plants were purchased.

Wardian cases of plants were despatched to :—Uganda Dept. of Agriculture; Amboni Estates, Tanganyika Territory; Ootacamund Botanic Garden; Mauritius Dept. of Agriculture; Mr. M. T. Dawe, Sierra Leone; Singapore Botanic Gardens; Dr. B. Moiser, Sokoto, Nigeria and the Emir of Katsina.

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**Museums.**—The Staff has been actively engaged during the past year in determining and reporting upon a large and extremely varied number of economic products received from correspondents and visitors to the Museums. Questions relating to the identification, origin, and uses of timbers and oil seeds show a considerable increase over former years which appears to indicate that commercial firms are becoming better acquainted with this phase of the activities of Kew.

The facilities offered in the Museums for educational purposes have been put to good use by the London County Council and other educational bodies, for large numbers of school children accompanied by their teachers spent a good deal of time examining the collections during the summer months.

During the year special educational exhibits were brought together on several occasions. These included :—The Effects of Fog and Smoke upon Vegetation; Diseases Injurious to Forest and Fruit Trees; Mud and Sand-binding Plants; and Kitchen and Dairy Utensils made of Home-Grown Woods.

The first-named exhibit directed attention to the deposits of dirt left upon the leaves of plants in the neighbourhood of London and other large cities during winter and the consequent enervating effect upon plant life. This was effected by the aid of sponged leaves contrasted with leaves as collected. In the same exhibit the serious effects of sulphuric acid, from fogs, upon plant life were shown. The disease exhibit illustrated some of the principal insect and fungus diseases with which gardeners and foresters have to cope. Various questions upon coast erosion made necessary the exhibit of sand and mud-binding plants, whilst the great unemployment question created a fitting opportunity for an exhibit of articles made from home-grown timber, thereby showing how woodlands and their exploitation may exert a considerable influence upon rural employment.

As has been the case for many years an exhibit of specimens illustrating British Forestry was made at the Annual Exhibition of the Bath and West and Southern Counties Agricultural Society at Plymouth. As the Forestry Commission now undertake

similar educational work the Director, after consultation with the Forestry Commissioners, decided in the interests of economy to amalgamate the Kew specimens with those of the Forestry Commission and to leave future exhibits to that body. It may here be noted that Dr. J. W. Munro, Entomologist to the Forestry Commission has been given laboratory accommodation at Kew thereby facilitating reciprocatory work between the two establishments.

Mr. J. H. Holland of the Museum Staff completed the last volume and index of "The Useful Plants of Nigeria," during the year. This work has an important bearing upon the economic plants of West Africa and towards its completion Mr. Holland has devoted the bulk of his non-official time for the past sixteen years.

Official visits were made by members of the Staff to the Bath and West and Southern Counties Show, the Museums Annual Conference at Leicester, and to Liverpool in connection with questions relating to various economic products.

Donations to the Museums have been acknowledged from time to time in the Bulletin and duplicate specimens have been distributed to the Municipal Museum, Newport; Museum and Art Gallery, Bristol; Royal Museum, Salford, Manchester; Cambridge Road School, Ellesmere Port; &c.

Some progress has been made with checking nomenclature and relabelling in Museum III.

Presentations to Museums.—The following miscellaneous specimens have been received :—

Mrs. C. Davis, Sandycombe Road, Kew Gardens.—Model of a Bengali village.

Mr. E. L. May, East Molesey.—Nest in wood of Leaf-cutting Bee.

Mr. W. C. Richards, Lonsdale Terrace, Kew Gardens.—Seven photographic views of local interest.

Dr. Hans Schinz, Botanic Gardens, Zurich.—Specimens of *Sarcocaulon rigidum* from South-west Africa.

Mr. R. Swainson-Hall, Victoria, Cameroons.—Eleven samples of woods collected in Portuguese Congo.

Mr. L. St. Clare-Rundlett, Myitkyina, Upper Burma.—Burmese Fan made of wood of *Podocarpus neriifolia* and Chinese Water-pipe.

Mr. J. H. Maiden, Director, Botanic Gardens, Sydney.—Five views of the Botanic Gardens, Sydney.

Mr. N. C. McLeod, Conservator of Forests, Gold Coast.—Sample of Barkcloth prepared from the bark of *Antiaris africana*.

Dr. Moiser, Sokoto, N. Nigeria.—Samples of Materials used locally for dyeing, together with some dyed skins, and a collection of medicinal plants used locally.

The Incorporated Oilseed Association, St. Mary Axe, London, E.C.—Seven samples of oilseeds.

Mr. D. W. Scotland, Director of Agriculture, Sierra Leone.—Decorticated grains of *Oryza Barthii* prepared for food in Sierra Leone.

Mr. P. S. Fowler, Pinit, Ltd., Old Palace Yard, Richmond.—Models of Pinit work in Black Walnut (*Juglans nigra*).

Col. F. Winn Sampson, Tannsfield, Sydenham.—Five mounted specimens of white Ants.

Mr. J. A. Little, The Avenue, Hitchin.—Leaf of *Alnus incana* galled by *Eriophyes brevitarsus.*

Mr. G. E. Bodkin, St. John's Wood, N.W.—Eighteen photographs of the Botanic Gardens, Georgetown, British Guiana.

Mr. Norman Smith, Travancore, Southern India.—Wood of Mango (*Mangifera indica*).

The Hon. Mrs. Smyth, Ashton Court, Bristol.—Door and panel made of Elm.

Acting Colonial Secretary, Bahamas.—Fruits of *Canella alba.*

Mr. M. T. Dawe.—Twenty-one samples of Mayombe timbers, Palm-sling for climbing purposes, made of stems of Ancistrophyllum sp. also photographs to illustrate method of using, Portuguese Congo. Double-handed hoe as used by Angola natives on the Malange plateau. Bag and Hat made of leaves of Oil-palm (*Elaeis guineensis*), interior of Angola.

Mr. E. P. Phillips, Division of Botany, Pretoria.—Sample of Coffee, made from the roasted rinds of Prickly Pear.

Miss I. E. Wright, Kew Gardens Road, Kew.—Branch of *Gymnocladus canadensis.*

Messrs. F. Westbury & Son, Great Dover Street, London, S.E.—Stem of Rattan (*Calamus* sp.) from the Malay Borneo Exhibition, Singapore. Placed in Museum No. III.

Mr. E. Hobbs, Southfield Road, Chiswick.—Model in Teak of an Indian Bullock Cart.

Mr. G. Trollip, Cape Town.—A small collection of seeds from Fort Victoria.

Mr. F. Evans, Superintendent of Agriculture, Nigeria.—Hats made at Ekona, Cameroons, from the fibre of *Raphia vinifera.*

Mr. E. Mathieu, Kuala Kangsar, F. M. States.—Samples of Roselle fibre (*Hibiscus Sabdariffa*, var. *altissima*) and *Sida rhombifolia.*

Professor H. G. Greenish, Pharmaceutical Society.—Ninety cabinet specimens of Eucalyptus woods from Australia.

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**Research in Jodrell Laboratory in 1922.**—Mr. L. A. Boodle made experiments on methods of treating plant-fibres for microscopic examination, and began some tests of the longevity of pollen in *Rhododendron.*

Miss M. G. Campin made observations on the chromosomes of the pollen mother-cells in a number of species of the *Solanaceae.*

Mr. R. N. Chrystal was engaged in studies on the life-history and feeding-habits of the *Chermesidae* injurious to Silver Fir and Pine.

Mr. S. Dickinson examined the anatomy of the leaf of Efwatakala Grass (*Melinis*) with special reference to the structure of the hairs and the excretion of oily substances.

Dr. J. W. Munro, Mr. R. N. Chrystal and Mr. R. C. Fisher carried out further experiments on the fumigation of plants with hydrocyanic acid gas with a view to controlling insect pests.

Mr. W. B. Turrill made additional determinations of the chloride content of samples of Thames water and of the water-supply of Kew Gardens in connection with injuries to plants by salt.

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**Presentations to the Library during 1922.**—The most important presentation of the year, as has been the case in many previous years, has been made by the Bentham Trustees, who, in addition to supplying the library with the continuation of several periodicals received in exchange for *Hooker's Icones Plantarum*, have presented it with a complete set of the fine edition of Galen's works by C. G. Kuehn, forming volumes i.—xx. of *Medicorum Graecorum opera*, published at Leipzig, 1821-33. The works of Hippocrates, forming volumes xxi.-xxiii. (1825-27) of this edition of the writings of the ancient Greek physicians, have also been presented by the Bentham Trustees.

The large collection of Sir J. D. Hooker's original correspondence, and other manuscript matter, which was deposited in the library on loan by the late Lady Hooker, has now been presented to the establishment by the Trustees of Sir Joseph's residuary estate. Mr. J. S. Gamble has presented 89 letters written to him by Sir J. D. Hooker during the period 1884-1910.

The Secretary of State for India has presented the reprint of the second edition of J. S. Gamble's *Manual of Indian timbers*, parts 2 and 3 of *The botany of Bihar and Orissa*, by H. H. Haines, and K. Rangachari's *Manual of botany*, ed. 2.

From the Secretary of State for the Colonies have been received several publications of the Department of Agriculture, Mesopotamia, including Administration Report . . . for the year 1921, and *Dates and date cultivation of the Iraq*, by V. H. Dowson, parts 1 and 2, of which a copy has also been received from the publishers of the work, Messrs. W. Heffer & Sons, Cambridge.

From the Gouvernement général de l'Afrique occidentale française 6 publications of the Inspection générale de l'Agriculture, de l'Élevage et des Forêts have been received ; these deal with cotton, the ground-nut (*Arachis hypogaea*), and the oil-palm.

As in former years the library has received liberal contributions from botanical, agricultural and other public institutions, particularly those of the British Colonies and Dominions, India, Java, the Philippine Islands, Japan and the United States of America, and from those of some of the countries of Europe, notably those of Sweden, Denmark, Holland, Belgium, France and Switzerland. To the Agricultural Research Institute, Pusa, the Department of Agriculture, Buitenzorg, Bureau of Science,

Manila, the United States Department of Agriculture and the Smithsonian Institution the establishment is particularly indebted.

Prof. Hans Schinz has presented the third part of the first volume of the botany of *Nova Caledonia*, edited by himself and Mr. A. Guillaumin, and 3 *Mitteilungen aus dem Botanischen Museum der Universität Zürich*.

Dr. N. L. Britton has presented 2 further parts of the *North American Flora*, 11 *Contributions from the New York Botanical Garden*, and the issues during the year of the *Bulletin* and *Journal* of the same establishment.

From the Director of the Bernice Pauahi Bishop Museum, Honolulu, have been received a valuable contribution to our knowledge of the grasses of Hawaii, by A. S. Hitchcock, forming vol. viii. no. 3 of the Memoirs of the Museum, and the Report of the Director for 1921.

Madame Augustin de Candolle has presented a collection of 13 papers on *Piperaceae* by the late Dr. Casimir de Candolle, and obituary notices of Dr. C. de Candolle and M. Augustin de Candolle.

Mr. J. H. Maiden has published during the year 7 more parts of his colossal work on *Eucalyptus*. In all 56 parts have now been received from him, while 70 parts (69 and 70 during 1922) of his *Forest Flora of New South Wales* have been presented by the Secretary of Agriculture, Sydney.

Lieut.-Col. Sir David Prain has presented bound sets of his *Memoirs and Memoranda*, 1887-1893, and his *Botanical Notes and Papers*, 1894-1901; also about 30 numbers of the *Proceedings of the American Philosophical Society*, 1917-22, *Travaux du Laboratoire de Matière médicale de la Faculté de Pharmacie de Paris*, tome xiii., the year's issues of the *Berichte der Deutschen Botanischen Gesellschaft* and the *Bulletin de la Société botanique de France*, the first volume of *The Forests of India*, by E. P. Stebbing, and several reprints.

Miss E. T. Masters has presented numerous publications that belonged to her father, Dr. M. T. Masters; among them are many of his papers on *Coniferae*, *Malvaceae* and *Restiaceae*, several of which are annotated by him.

Mr. C. G. Lloyd of the Lloyd Library and Museum, Cincinnati, Ohio, who is at present on a visit to Kew, has presented 2 bound sets of the *Bibliographical Contributions from the Lloyd Library*, and a bound copy of volume vi. of his *Mycological Writings*. The first volume of the *Bibliographical Contributions* contains a Bibliography relating to Floras, the names of the authors being arranged alphabetically under countries or groups of countries, while the second and third volumes contain a Bibliography relating to Botany exclusive of Floras. These volumes are not merely a catalogue of the botanical books in the Lloyd Library, which in 1918 contained nearly 48,000 volumes; Mr. Lloyd's aim has been to compile as complete a bibliography of botanical books as is possible, "from all available sources," to produce, therefore, an up-to-date *Thesaurus*

*Literaturae Botanicae.* At Kew the great usefulness of these *Bibliographical Contributions from the Lloyd Library*, and especially that of the volume relating to Floras, has been repeatedly demonstrated. A complete subject catalogue of botanical literature is badly needed, and we hope Mr. Lloyd will be able to continue to give his assistance towards producing one.

Amongst the publications of societies and institutions presented during the year the following should be mentioned:— *Annales des Epiphyties*, tome vii., from Directeur, Station de Pathologie végétale, Paris; *Annals of the Royal Botanic Garden, Calcutta*, vol. xii. pt. 2 (text and plates), from Superintendent; *Archivos do Jardim Botanico do Rio de Janeiro*, vol. iii., from Director; *Botanical Survey of South Africa*, Memoir no. 3 (*South African Cyperaceae*, by Dr. S. Schonland), from author and Director of the Survey; *British Empire Forestry Conference*, 1920, a complete set of the statements prepared by the Forestry Commission, and *Journal of the Empire Forestry Association*, vol. i., from Secretary; *Contributions from the Osborn Botanical Laboratory, Yale University*, 1920–21, from Director; *Cornell University Agricultural Experiment Station, Memoirs and Bulletins*, from Director; *East Malling Research Station*, 5 papers, from Director; *Harvard Forest Bulletins*, nos. 1–4, from Director; *Indian Tea Association, Quarterly Journal*, from Secretary; *Japanese Journal of Botany*, from the National Research Council of Japan; *Journal of the Arnold Arboretum*, complete set up to vol. iii. no. 1, from Director; *Journal of the Gold Coast Agricultural and Commercial Society*, from Secretary; *McGill University Publications*, series II., Botany, nos. 1–11, from McGill University Library; *Madras Government Museum, Catalogue of the Exhibits in the Economic Products Section*, from Superintendent; *Mededeelingen van de Landbouwhoogeschool* (Wageningen), 7 numbers, from Prof. E. Giltay; *Notes from the Botanical School of Trinity College, Dublin*, from Prof. H. H. Dixon; *Orchid Review*, 1922, from Editor, Mr. Gurney Wilson; *R. Stazione Sperimentale . . . in Acireale, Bollettini* and *Annali*, from Director; *R. Stazione di Patologia vegetale di Roma, Bollettini* and other publications, from Director; *Recueil des Travaux botaniques néerlandais*, from the Koloniaal Museum, Dreef, Haarlem; *Report of the Australasian Association for the Advancement of Science*, 1921, from General Secretary; *Report of the British Association for the Advancement of Science*, 1921, from Miss E. M. Wakefield; 7 Reports of the Director of the Botanical Survey of India, from Director; *Revue de Botanique appliquée et d'Agriculture coloniale*, from Dr. A. Chevalier; *Review of Applied Mycology*, from Director, Imperial Bureau of Mycology, Kew; *South African Journal of Natural History*, from Secretary; *Station fédérale d'Essais viticoles de Lausanne*, 4 papers, from Director; and *University of California Publications in Botany*, from Manager, University Press, Berkeley.

Other publications received as presentations are :—*Manual of British botany*, by C. C. Babington, edition 10, by A. J. Wilmott, from its publishers, Messrs. Gurney and Jackson; *Manual of Indian botany*, by G. C. Bose, from Mr. S. T. Dunn; *Nigeria handbook*, compiled by A. C. Burns, third issue, from the Crown Agents for the Colonies; *Flora Ibérica : Briófitas*, pt. 1, by A. Casares-Gil, from Director, Imperial Bureau of Mycology, Kew; *The distribution of the vegetation and flora of New Zealand*, by L. Cockayne, from the Trustees of the Cawthron Institute, Nelson, New Zealand; *Illustrations of the British flora*, by W. H. Fitch and W. G. Smith, edition 4, from Dr. A. W. Hill; *Details of specimens of Rhododendrons found by G. Forrest in* 1921, from Mr. J. C. Williams; *The forest flora of New Zealand*, by T. Kirk, 1889 (small paper copy), from Miss Gertrude Fennell; *Census report on the mosses of Ireland*, by Canon H. W. Lett, from Mr. H. N. Dixon; *School botany*, 1854, and *Medical and economical botany*, 1856, both by J. Lindley, from Mr. A. D. Cotton; *Handbook to the natural history of Cambridgeshire*, by J. E. Marr and A. E. Shipley, 1904, from Dr. A. W. Hill; *Ecological studies in the Tong-nai river basin, North Korea*, by R. G. Mills, from Mr. S. T. Dunn; *La Californie et les grands déserts américains*, by P. L. Monnet, from Mr. R. Monnet; *An enumeration of plants hitherto known from Corea*, by T. Mori, from the Government of Chosen; *An Account of the genus Sedum as found in cultivation*, by R. Lloyd Praeger, from the Royal Horticultural Society; *Alphabet of Botany*, by J. Rennie, 1836, from Mr. T. A. Sprague; 89 reprints of botanical papers from the *Annals of Scottish Natural History*, by the late Prof. J. W. H. Trail and others, from Prof. W. G. Craib; *Illustrations of the flowering plants and ferns of the Falkland Islands*, by Mrs. E. F. Valletin, with descriptions by Mrs. E. M. Cotton, from the Editor of *Nature*.

The following have been presented by their authors :—*Studies of the vegetation of the English chalk*, by R. S. Adamson; *Orchidaceae*, by Oakes Ames, fascicle VII; *Die Violen der Philippinen*, by W. Becker; *Flora of South Australia*, by J. M. Black, part 1; *The ferns of Bombay*, by E. Blatter and J. F. d'Almeida; *Emile Burnat—autobiographie*, by J. Briquet and F. Cavillier; *Plantae Bequaertianae*, by E. De Wildeman; *Beiträge zur Kenntnis der Vegetation und Flora der Seychellen*, by L. Diels; *Das Leben des Malvenrostpilzes in und auf der Nährpflanze*, by J. Eriksson; *Malayan Forest Records* no. 2, by F. W. Foxworthy; Reprints of 97 botanical papers, by F. Gagnepain; *Malay poisons and charm cures*, by J. D. Gimlette, edition 2 (copy also received from the publishers of the work, Messrs. J. & A. Churchill); *The poison plants of Western Australia*, and other papers, by D. A. Herbert; *Hortus Linnaeanus*, by H. O. Juel; *Formosan trees*, by R. Kanehira; *Flora Balearica*, by H. Knoche, parts 1 and 2; *Le piante più notevoli del R. Orto Botanico di Pisa*, by B. Longo; 7 Papers on North African botany, by R. Maire; *Review of the new species of plants*

*proposed by N. L. Burman in his Flora Indica*, by E. D. Merrill; *Flora sylvatica Koreana*, by T. Nakai, pt. XI; *A list of flowering plants from Inner Asia, collected by Dr. Sven Hedin*, by C. H. Ostenfeld and O. Paulsen; *Five years' observations on the bionomics of Southern Nigerian insects*, by the late C. O. Farquharson, edited by E. B. Poulton, from Editor; *Bibliography of the woods of the world*, and *Boxwoods of commerce*, by S. J. Record; *Contribution à l'étude des boissons toxiques des Indiens du Nord-Ouest de l'Amazone*, by P. Reinberg; *Descriptions of three hundred species of South American plants*, by H. H. Rusby; *The natural history of Juan Fernandez and Easter Island*, edited by C. Skottsberg, vol. ii. pt. 2, from Editor; *A simple key to one hundred common trees of Burma*, by C. B. Smales; 41 Papers, chiefly on Orchidaceae, including contributions to *Nova Guinea*, by J. J. Smith; *The centenary of the Royal Botanic Gardens, Peradeniya*, by F. A. Stockdale, T. Petch, and H. F. Macmillan; *A guide to the identification of the more useful timbers of Nigeria*, by H. Stone and H. A. Cox; *A Supplement to F. Hamilton Davey's Flora of Cornwall*, by E. Thurston and C. C. Vigurs, from Mr. Thurston; and *With Lord Byron at the Sandwich Islands in* 1825; *being extracts from the MS. diary of James Macrae, Scottish botanist*, by W. F. Wilson.

Colonel W. G. King, I.M.S., C.I.E., whose presentation of 842 paintings of Madras and Burmese plants, by the late Mrs. King, was mentioned in *K. B.* 1922, p. 42, has since given to the library a volume containing about 230 paintings in Indian "earth colours" of medicinal plants used by Mahommedans; it was once the property of a "hakeem" of Kurnool, Madras Presidency, and its date is probably about 1854. Miss Macbean has presented a volume containing 213 paintings from nature of plants (mostly introduced) in St. Helena; these paintings were made by her father, General W. Forbes Macbean, in 1848.

Contributions to the Kew collection of drawings of plants have been received from Mrs. Ernest Hart (128 drawings of Japanese plants), Dr. W. Botting Hemsley (numerous published illustrations of species of *Eucalyptus*), Miss Alice Mungo Park (19 water-colour drawings by her sister of plants growing in Madeira, chiefly cultivated), Miss M. Smith (41 plates from Mrs. Valletin's *Illustrations of the flowering plants and ferns of the Falkland Islands*), and from the Royal Horticultural Society (7 original drawings for the *Botanical Mayazine* and 12 proofs).

Monsieur F. Gagnepain, in addition to the large collection of his own botanical papers mentioned above, has presented 12 portraits of French Botanists including E. Bureau, G. A. Chatin, M. Cornu, E. A. Finet, A. Franchet, A. F. M. Glaziou, E. Malinvaud, J. B. L. Pierre, J. A. Ramond, B. Renault and E. Roze.

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**Report of the Herbarium, 1922.**—The average number of specimens received at the Herbarium for the five years 1910–1914 was somewhat over 31,000 per annum and during the

years 1920 and 1921 an approximate return to these pre-war figures was reached. The amount of material received during 1922 far exceeded all previous records, the total number of specimens being 60,035.

With the scientific staff still below the pre-war strength the task of dealing even superficially with such a vast amount of material is exceedingly heavy. The naming of the large collections is the work of years, but in pursuance of the policy always adopted by Kew an effort was made to deal as speedily as possible with small collections and individual specimens for name. It is realised that prompt determination of plants of scientific interest or of economic value is of the utmost importance to workers in the Colonies and Dependencies. In spite of the Assistantship for South Africa still being vacant, an attempt was made to meet the most pressing needs of all the African colonies. With a vacancy existing also on the general staff, Australian plants perforce continue unfortunately to be neglected and supplies from that continent have, in consequence, largely ceased to arrive.

Collections received and dealt with in 1922.—The number of specimens received is shown in the following table :—

| | |
|---|---|
| Collections purchased | 6,335 |
| Collections received as donations, or in exchange | 53,700 |
| Specimens received in small numbers [name-book entries] | 3,350 |
| Specimens for examination received on loan | 2,353 |

The number of specimens acquired under the first two headings is 60,035; those under the third heading are not included on account of the large number of common and useless plants they contain. It may be mentioned that the very large figure for this year is chiefly to be accounted for by the presentation of the herbarium of the late Mr. J. R. Drummond by his Executors, although the number of duplicates which it is estimated will be distributed has been deducted. Apart from the Drummond herbarium, however, the figure for 1922 is a record.

The routine work of the year may be summarised as under :—

| | |
|---|---|
| Specimens poisoned | Approx. 20,000 |
| Specimens laid out and prepared for mounting | 16,905 |
| Specimens mounted | 23,692 |
| Named specimens incorporated in the Herbarium | 26,064 |
| Specimens distributed as duplicates | 8,619 |

From this it will be seen that of the 60,000 specimens received during the year, an amount of less than half that number have been put away named in the general collection, and it should be

added that the large number of 26,000 incorporated is partly due to the valuable assistance of volunteers among whom should be specially mentioned Messrs. J. Burtt Davy, J. S. Gamble, H. N. Ridley, L. A. Riley and Dr. O. Stapf, who in the course of their private studies have assisted in the naming and laying in of many hundred specimens.

Reference should be made to the cellular cryptogams, of which it is less easy to keep exact returns, and which in consequence are not included in the last set of figures. Large collections of Fungi arrive annually from the Colonies, especially Africa. Owing to the absence of herbaria and lack of literature, workers in the tropics find it an exceedingly difficult, if not an impossible, task to identify Fungi.

The principal collections received are as follows :—

EUROPE.—*Presented :* Britain; Cornwall, by Mr. Edgar Thurston; Orkneys, by Col. H. H. Johnston; various localities, by Mr. C. E. Salmon and Mr. W. B. Turrill; Austria, by Dr. O. Stapf; Kryptogamae Exsiccatae, cent, 26, by Dr. A. Zahlbruckner; Flora Hungarica, cent 2-5, by Dr. F. Filarsky; Serbia, Bulgaria, Slavonia, Istria and the Karse, by Mr. & Mrs. W. B. Turrill; Gallipoli, by Lt.-Col. F. R. Durham; Greek Macedonia, by Maj. G. W. Harris; Balearic Islands, by L. H. Knocke.

*Purchased :* Dr. A. Hayek, Centaureae Exsiccatae, fasc. 3, nos. 101-140; H. Sydow, Mycotheca Germanica, fasc. 29-36; I. Nowopokrowski, Russian seeds from the Don District.

ORIENT.—*Presented :* Syria (coll. B. T. Lowne) and Asia Minor (coll. Balansa) by Mr. C. E. Salmon; Palestine, by Mrs. V. E. Buxton.

ATLANTIC ISLANDS.—*Presented :* Madeira, by Miss A. Mungo Park; Azores (coll. T. Carew Hunt), by Capt. G. W. Carew Hunt; Azores (coll. J. A. Brewer), by Mr. C. E. Salmon.

CHINA.—*Presented :* G. Forrest, by the Syndicate which organised the expedition; W. Purdom, by Prof. C. S. Sargent; W. Hancock, by Miss Hancock; Chinese seeds, by Mrs. E. M. Reid.

*Purchased :* Rev. E. Licent, Tientsin; M. Gandoger, coll. L. Chanet and H. Serre; Rev. J. Cavalerie.

INDIA.—*Presented :* Dehra Dun, by Mr. R. S. Hole; North-Western Himalaya (coll. R. R. & I. D. Stewart), by Mr. R. R. Stewart; Punjab, etc., by Mr. J. R. Drummond; Mount Everest Expedition.

*Purchased :* Rev. L. Anglade; Madras, Pulney Hills.

MALAY PENINSULA.—*Presented :* various localities, by Mr. I. H. Burkill.

MALAYA.—*Presented :* Siam, by Dr. A. F. G. Kerr; Siam (coll. W. B. Garrett and Luang Winit), by Mr. W. F. Lloyd; Philippine Islands, by Mr. E. D. Merrill and Prof. Oakes Ames; British North Borneo, by Mr. E. D. Merrill; Sumatra (coll. Mrs.

E. M. Burkill and Mohamed Nur), by Mr. I. H. Burkill; Java, by the Director, Botanic Gardens, Buitenzorg.

*Purchased :* A. D. E. Elmer, Borneo.

AUSTRALIA.—*Presented :* Queensland, by Mr. C. T. White; Western Australia, Swan River, by Mr. A. Cayzer; Northern Territory, between Darwin and Alice Springs, by Mr. C. E. F. Allen.

POLYNESIA.—*Presented :* Svenska Pacific Expedition (coll. C. and Inga Skottsberg), by Dr. C. S. Skottsberg; Fiji, by Mr. W. Greenwood; Hawaiian Islands, by Mr. A. S. Hitchcock.

TROPICAL AFRICA.—*Presented :* Nigeria, Sokoto, by Dr. B. Moiser; Nigeria, by Mr. John Dent-Young; Gold Coast, by Dr. J. M. Dalziel and N. C. McLeod; Cameroons, by Mr. G. L. Bates; Angola and Portuguese Congo by Mr. M. T. Dawe; Sudan, by Maj. Guy Aylmer; Upper Sudan, Mongalla Province, by Mr. C. H. Lankester; Uganda, by Mr. J. D. Snowden; Kenya Colony, by Mr. R. A. Dümmer, and Mr. E. A. Walters; Rhodesia and the Congo Region, by the Rev. F. A. Rogers and Mr. J. Burtt-Davy; Rhodesia, (coll. F. Eyles), by the Division of Botany, Pretoria; Rhodesia (coll. J. A. S. Walters), by the Department of Agriculture, Rhodesia, and (coll. Dr. R. E. Fries), by H. O. Juel.

*Purchased :* R. A. Dümmer, Kenya Colony, Great Rift Valley.

SOUTH AFRICA.—*Presented :* Griqualand East, by Miss M. Wilman; various localities, by the Division of Botany, Pretoria, Mr. H. G. Fourcade, Mr. J. Burtt-Davy and the Rev. F. A. Rogers.

NORTH AMERICA.—*Presented :* Greenland (coll. A. C. Seward and R. E. Holttum), by Prof. A. C. Seward; Nova Scotia (coll. M. L. Fernald and B. Long), by Dr. B. L. Robinson; specimens cultivated in the Arnold Arboretum, by Prof. C. S. Sargent; Reliquiae Farlowianae, by Dr. R. Thaxter; Western United States (coll. J. B. Leiberg), by the U.S. National Museum; Californian grasses, by Lt.-Col. H. H. Wolley-Dod; United States Fungi, by Mrs. Flora W. Patterson.

*Purchased.*—B. F. Bush, Missouri.

CENTRAL AMERICA.—*Presented :* Mexico (coll. G. Arsène), by the U.S. National Museum; Yucatan (coll. G. F. Gaumer & Sons, by Dr. C. F. Millspaugh.

WEST INDIES.—*Presented :* Jamaica, by Dr. Janet R. Perkins; Trinidad, etc., by Dr. N. L. Britton; Cuba, Havana and Pinar del Rio, by Dr. C. F. Millspaugh.

*Purchased :* Miss M. H. Shaw, Barbados and other Algae.

SOUTH AMERICA.—*Presented :* British Guiana grasses, by Mr. A. S. Hitchcock; Colombia (coll. E. André), by Bentham Trustees; Fungi (coll. Dr. J. N. Rose), by Mrs. F. W. Patterson.

GENERAL.—5089 miscellaneous plants, by the Muséum National d'Histoire Naturelle, Paris.

Mr. Edgar Thurston, C.I.E., who presented his herbarium of Cornish plants to Kew in 1919, has added to it the specimens collected by him and his co-workers during 1921. Col. H. H. Johnston, C.B., has continued his investigation of the Flora of the Orkneys and presented his recent discoveries. Interesting collections made by Lt.-Col. F. R. Durham, O.B.E., M.C., Major G. W. Harris and others in the nearer East have been received and a detailed report on them published in the *Bulletin*, 1922, pp. 291-298. Mr. and Mrs. W. B. Turrill have presented the specimens and seeds collected by them during their recent tour through the Balkan Peninsula. Various British and Oriental plants, including some additional ones collected in Syria by Mr. B. T. Lowne, have been presented by Mr. C. E. Salmon, F.L.S. The valuable collection of Azores plants made by Mr. T. Carew Hunt between 1844 and 1848 has been described in the *Bulletin*, 1922, p. 47; a collection made by Mr. J. A. Brewer in the same islands has been presented by Mr. C. E. Salmon. With regard to China, the presentation of Mr. G. Forrest's collections from N.-W. Yunnan and S.-E. Tibet has been recorded in the *Bulletin*, 1922, p. 174. The collection made around Tientsin by the Rev. E. Licent and that from Northern Yunnan, by the Rev. J. Cavalerie have been acquired by purchase. The Chinese herbarium of the late Mr. W. Hancock, F.L.S., has, according to his wish, been presented, to Kew by his sister, Miss Hancock, and at his desire the duplicates are being sent to the University of Bristol. (See *Kew Bulletin*, 1922, p. 204). Mrs. E. M. Reid having obtained, in connection with her work on fossil fruits and seeds, some Chinese seeds has kindly presented a set of them.

The Indian herbarium of the later Mr. J. R. Drummond, B.A., F.L.S., from the Punjab and other parts of India presented by his Executors, containing about 30,000 specimens is being dealt with at Kew, and is a most valuable acquisition. The plants collected during the Mount Everest Expedition, 1922, have also been presented to Kew by the Mount Everest Committee, and are now being worked out. Various collections made in Siam by Dr. A. F. G. Kerr, Mr. W. F. Lloyd, Mr. W. B. Garrett and Luang Winit have been received as well as specimens from lower Siam and the Malay Peninsula from Mr. I. H. Burkill. M.A., F.L.S. Philippine orchids have been presented by Prof. Oakes Ames and nearly 3,000 other plants from the same islands and Borneo by Mr. E. D. Merrill, Sumatran plants collected by Mrs. E. M. Burkill and Md Nur have been sent by Mr. I. H. Burkill.

The only Australian collections received have been those presented by Mr. C. E. F. Allen which he collected on a journey from Darwin to Alice Springs, various Queensland plants which have been received from Mr. C. T. White, and specimens from Mr. A. Cayzer from Western Australia.

Mr. W. Greenwood has sent fresh instalments of the plants collected by him in Fiji. From Dr. C. Skottsberg specimens have

been received collected by him and Mrs. Inga Skottsberg during the Svenska Pacific Expedition.

Dr. B. Moiser, Principal Medical Officer, Sokoto, Nigeria, has sent interesting collections from the Sokoto district of Nigeria and Mr. M. T. Dawe, F.L.S., has sent large collections from Angola and the Portuguese Congo. Major Guy Aylmer has presented his collection from the Sudan and Mr. C. H. Lankester one made by him in the Mongalla Province, Upper Sudan. The Rev. F. A. Rogers, M.A., has continued to send specimens collected by him in the Congo Region and Rhodesia. A collection made by Mr. F. Eyles in the latter region has been presented by Dr. I. B. Pole-Evans, C.M.G. Plants from Griqualand East have been presented by Miss M. Willman, and from other parts of South Africa by Dr. I. B. Pole-Evans, Mr. J. Burtt-Davy, F.L.S., Mr. H. G. Fourcade and the Rev. F. A. Rogers.

Lt.-Col. H. H. Wolley-Dod, R.A., has sent over 200 grasses collected by him in California, and Prof. C. S. Sargent, LL.D., has presented specimens of over 300 plants cultivated in the Arnold Arboretum. Cryptogams left by the late Prof. G. Farlow have been presented by Dr. R. Thaxter.

Dr. C. F. Millspaugh has presented a set of specimens collected in Yucatan by Mr. G. F. Gaumer and his sons, and also some collected in Cuba, Havana and Pinar del Rio by Mr. H. A. van Hermann. Dr. N. L. Britton and Dr. Janet R. Perkins have sent collections from various West Indian Islands. A set of Barbados Algae named by the late Dr. Bornet has been purchased from Miss M. H. Shaw. Specimens of some of the families not contained in the herbarium of the late E. André when it was presented in 1912 have now been acquired from his son, Mons. R. E. André and presented by the Bentham Trustees.

To the Muséum National d'Histoire Naturelle, Paris, Kew is indebted for a collection of over 5,000 specimens from various localities.

*Visitors*.—About 3,700 visits have been made to the herbarium during the year. Amongst those who have paid frequent visits or have made a prolonged stay may be mentioned :—Prof. Oakes Ames, Cambridge, Mass. (Orchidaceae); Mr. E. G. Baker (British Museum) African; Mr. and Mrs. A. F. Broun (Sudan plants); Mr. N. E. Brown (South African and South American plants); Dr. A. H. R. Buller, Winnipeg (Canadian and British Fungi); Mr. and Mrs. J. Burtt-Davy (Transvaal plants); Mrs. Agnes Chase, Washington, D.C. (American Gramineae); Mr. S. Dickinson (British Fungi); Mr. H. N. Dixon, Northampton (Musci); Mr. W. Fawcett, British Museum (West Indian plants); Mr. J. S. Gamble (Flora of Madras); Mons. F. Gagnepain, Paris (Indo-Chinese Euphorbiaceae); Mr. H. H. Haines (Flora of Orissa and Behar); Mr. L. Hall (Plant Chemistry); Prof. A. Henry, Dublin (Conifers); Mr. W. O. Howarth, Manchester (Gramineae); Mr. L. V. Lester-Garland (Australian plants); Mr. C. G. Lloyd, Cincinnati (Fungi); Mr. E. W. Mason, Imperial

Bureau of Mycology (Fungi); Dr. C. F. Millspaugh, Chicago (Euphorbiaceae); Mr. J. Parkin (Phylogeny); Mr. W. R. Price (Formosan plants); Mrs. E. M. Reid and Miss M. E. J. Chandler (fossil fruits and seeds); Mr. H. N. Ridley (Flora of Malay Peninsula and Islands); Mr. L. A. Riley (South American plants); Rev. F. A. Rogers (Tropical and South African plants); Prof. Seiya Ito, Sapporo (Japanese Fungi); Dr. Perley Spaulding, Washington (Forest Pathology); Dr. O. Stapf (Tropical African Gramineae and Botanical Magazine); Prof. D. Thoday (South African Thymelaeaceae); Mr. Edgar Thurston (Cornish flora); Dr. W. Trelease (Piperaceae); Dr. J. G. Walker, Madison, Wisc. (pathology); Mr. E. H. Wilson (Chinese plants).

In addition to the above, the staff employed on the compilation of the Royal Horticultural Society's new edition of Pritzel's Index Iconum, under the direction of the Editor, Dr. O. Stapf, has been accommodated in the Herbarium and the preparation of the Plates and text of the Botanical Magazine has also been carried out mainly in The Herbarium and Library.

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**Peradeniya, New Laboratories.** — In *Kew Bulletin*, 1922, p. 207, in commenting on the centenary of the Royal Botanic Gardens, Peradeniya, Ceylon, reference was made to the long and interesting record of research which had been carried out not only by the resident staff of the Department, but also by many well-known visitors.

It is therefore very gratifying to learn that the special attention which H.E. the Governor, Sir William Manning, has devoted to the prosecution of the agricultural interests of the country has resulted in the erection and equipment of two up-to-date laboratories for Entomology and Mycology and the necessary quarters for the staff.

On the occasion of the opening of these new laboratories by His Excellency in October last, the Director of Agriculture, Mr. F. A. Stockdale, referred to the past excellent work that had been carried out there with such meagre accommodation and equipment. It had been a great achievement, and with this handicap removed they were now a long way towards meeting any emergency which might arise to threaten the important agricultural interests of the country.

The importance of adequate properly equipped laboratories in connection with the large botanical and agricultural establishments of the Empire in the Tropics cannot be over-estimated. The majority of the problems affecting tropical plant life can only be investigated amid their natural conditions of growth, and it is all the more important that not only the permanent staffs of Colonial Departments are enabled to work out these problems under suitable conditions, but that visitors travelling with the intention of investigating special problems also have all possible facilities to aid them. The completion of these new laboratories at

Peradeniya, with that opened in 1921 at the Botanic Garden, Singapore, forms two more important links in the chain of stations throughout the Empire where plant life can be investigated under the most favourable conditions.

An account of the opening ceremony and photographs of the two new laboratories appeared in the Tropical Agriculturist, November 1922.

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**Fruiting of Ginkgo biloba.**—In continuation of the article on "The Fruiting of Ginkgo biloba" which appeared in *K. B.* No. 9, 1922, pp. 262–265, information has recently been received from Mr. J. D. Halliburton, Superintendent of Parks, Bath, of the fruiting of a tree during 1922 at "Glenfield," Western Park, Bath, the residence of the Rev. Frederick N. Carus-Wilson. The tree was planted as a sapling about 1870. It is now about 40 ft. high and the trunk girths 3 ft. 9 ins. at 3 ft. from the ground. The spreading habit, as far as can be judged from a photograph, is identical with that of well-known male trees, thereby disproving the theory that a variation in habit exists between male and female trees. As it stands 400 yards from the nearest male tree pollen must be carried a considerable distance if the species is not parthenogenetic as has been suggested. As, however, pollen is borne in abundance there is no reason why it should not be carried that distance by wind or insects. The tree is said to have borne a good crop of seeds.—W. D.

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

No. 2] [1923

## V.—CONTRIBUTIONS TOWARDS A PHYLOGENETIC CLASSIFICATION OF FLOWERING PLANTS. I.

J. Hutchinson.

Mr. Hutchinson has devoted much of his leisure time during the past few years to a careful study of the genera and species of the more primitive groups of archichlamydeous (polypetalous) families of flowering plants.

This very valuable piece of work has been undertaken with the object of preparing a phylogenetic system of classification of natural families and genera, and it is intended in due course to publish the full results of these studies as a separate work.

Since it is very desirable to make known some of the conclusions already reached by the author, it will be convenient to publish occasional papers in the *Bulletin*, and the present contribution represents the first instalment.

These contributions will provide keys to the larger families and include all the described genera arranged, as far as may be possible, on the basis of their probable phylogeny.

The general principles governing this phylogenetic sequence are explained on p. 73.

Mr. Hutchinson has already published two papers which properly belong to the series in contemplation, namely, The Winteraceae (*Kew Bull.* 1921, 185–191), and The Genera of Fumariaceae and their Distribution (*Kew Bull.* 1921, 97–115), and also a joint paper with the late Mr. J. R. Drummond on Isopyrum and Allied Genera (*Kew Bull.* 1920, 145–169).—A. W. H.

Perhaps no subject is of more general interest to botanists of the present decade than the problem of the early race-history or phylogeny of plant life, and during recent years, especially, of flowering or seed-plants. The study of phylogeny, combined with that of the past and present distribution of plants, furnishes important evidence in regard to the question of former land connections between areas now separated by wide oceans, a subject which has repeatedly attracted the attention of biologists. Especially is this the case where marked similarity in the floras of far distant regions is clearly evident, such, for example, as

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(1) the Eastern United States and Eastern Asia, (2) the flora of the West African rain forest with that of the eastern coast of Brazil, (3) the Mascarene flora and that of Southern India, (4) the South African and West Australian floras, (5) the New Zealand and South West American floras, and nearer home (6) the South West British and Lusitanian floras.

Whether these areas were at one time connected by intervening land bridges, where now are deep oceans, or whether they were actually once contiguous areas which have now become separated will for long remain a debatable question. Certainly the comparatively new theory* of the origin of continents, *i.e.*, by displacement and gradual divergence one from another, would easily explain many of the problems of plant distribution. Though this subject cannot be fully dealt with here, it seems significant that with few exceptions these floral affinities of distant areas are entirely in an east and west direction and hardly ever north and south. I disregard for the moment the supposed affinity between the Mediterranean and South African floras which may be due to parallel evolution in the two hemispheres.

The distribution of the filmy fern, *Hymenophyllum ferrugineum*, of Juan Fernandez, Chile and New Zealand, cannot easily be explained otherwise than by a former land connection, especially when we consider also the distribution† of *Galaxias attenuata*, a fresh-water fish, which occurs in South East Australia, Tasmania, New Zealand and subantarctic South America. I merely quote these examples from among a multitude of others to show that the phylogeny of plants is intimately connected with many interesting biological problems and should not be neglected, and a phylogenetic system of classification should be the ultimate aim of taxonomy. In fact the description of every new genus, every new species or form of plant may be regarded as a contribution towards this end.

## Systems of classification.

The number of systems of classification is now very considerable. For an excellent account of the earlier systems the reader is referred to Lindley's "Vegetable Kingdom" (introduction), and for later schemes to Rendle's "Classification of Flowering Plants" (vol. 1, Historical Introduction). Since Lindley's time, however, only two great treatises have appeared which have commanded universal attention, namely, the "Genera Plantarum" of Bentham and Hooker, published in 1862–1883, which elaborated the De Candolle System, and the "Natürliche Pflanzenfamilien" of Engler and Prantl (1887–1909). From a phylogenetic standpoint both these works have been subjected to a considerable amount of criticism, especially that of Bentham and Hooker.

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* See A. Wegener, "The Origin of Continents and Oceans," in Discovery III., 114–118, figs. 1–3 (1922).

† See Cockayne "The Vegetation of New Zealand," in Engl. & Drude, "Die Veg. der Erde," 14 : 326 (1921).

And in recent years the Engler System has been assailed by certain North American* and British† botanists who have devoted special attention to the subject. Opinion in America in particular seems to have changed rapidly from an almost universal acceptance of the German system towards a modification of the arrangement of Bentham and Hooker which they had nearly abandoned. This criticism refers especially to the question of the relative primitiveness of the various groups from which a start should be made, such, for instance, as the position of the "Amentiferae" and other apetalous groups, and of the Monocotyledons.

*Bentham & Hooker's Genera Plantarum.*—The system of Bentham & Hooker was probably never intended to express a complete phylogenetic scheme of classification, for it is but a more extended arrangement of Jussieu's work elaborated as long ago as 1789, and further expounded by De Candolle in 1818, when botanists were still imbued with the idea of the fixity of species, and long before they had the aid of the Darwinian theory of descent as their guide.

Perhaps Jussieu should be reckoned second only to Linnaeus in that he was the first botanist to co-ordinate the genera of plants into families more or less as we now know them. Although a few of the names of his groups are unfamiliar to present-day botanists, nearly all in a slightly modified form are still in use. Bentham & Hooker's work was primarily concerned with a practical handbook to the genera of plants arranged in such a manner as best to facilitate their determination. For the moment, however, we may assume that Bentham & Hooker's Genera Plantarum was intended to express a more or less natural system, and examine the arrangement of their main groups. They began with the *Polypetalae*, their first Order (Cohort) being the *Ranales* composed of the well known *Ranunculaceae* and allied families, characterised by apocarpy and hypogyny of the flower. From these they proceeded to a disciflora series and finally (in the *Polypetalae*) to the calycifloral perigynous and epigynous types of flower. After these the *Gamopetalae* were enumerated, then the *Monochlamydeae* (*Apetalae*) and *Gymnosperms*, and finally the *Monocotyledons*. In elaborating their system, if we may continue to call it such, they unfortunately retained the *Monochlamydeae* as a group apart from the *Polypetalae*, and it is to this point and also to the anomalous position of the Gymnosperms that most criticism has been directed in the past. I use the word retained, for those distinguished authors were well aware of the true affinities of the families which compose these two unnatural groups. This is clearly seen by reference

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* See especially C. E. Bessey "The phylogeny and taxonomy of Angiosperms" Bot. Gaz. 24 : 145–178 (1897), and Ann. Missouri Bot. Gard. 2 : 109–164 (1915).

† E. A. N. Arber & J. Parkin, "The Origin of Angiosperms," Journ. Linn. Soc. Bot. 38 : 29 (1907).

to their notes on relationships at the end of each family description. Take, for example, the notes* accompanying *Illecebraceae* (vol. III. p. 2.) and other families of *Monochlamydeae* :—" Ordo *Amarantaceis* certissime affinis sed stipulis, perianthio herbaceo staminibusque perigynis differt. *Caryophylleae* distinguuntur floribus petaliferis ovario pluriovulato, fructuque capsulari; *Portulaceae* sepalis 2, corolla, capsulaeque dehiscentia. *Ficoideae* connexae sunt ope *Adenogrammatis* cui ovarium 1-loculare ovulo basilari. . . . Tribus *Scleranthearum* transitum ad *Caryophylleas* demonstrat. *Ficoidearum* tribus *Molluginеae* differt ovario polycarpico et staminibus saepissime hypogynis." Again. under *Monimiaceae*, we read " Ordo biformis sed bene naturalis, a pluribus botanicis *Anonaceis* approximatur ob gynaecium apocarpicum et embryonem saepius minimum, sed perianthio calycino apetalo albumine aequabili aliisque notis essentialibus longiuscule recedit. . . ." Then under *Lauraceae*, *Loranthaceae*, *Santalaceae*, *Euphorbiaceae*, *Platanaceae* and *Juglandaceae* we find similar notes of affinity with polypetalous families, and many of these suggestions were embodied by Engler & Prantl in their System.

*The System of Engler & Prantl.*—The chief difference between this system and that of Bentham & Hooker is the amalgamation of Jussieu's groups *Polypetalae* and *Monochlamydeae* under the single group *Archichlamydeae* and in the Monocotyledons taking precedence of the Dicotyledons. But in Engler's *Archichlamydeae* those apetalous families composing the so-called group *Amentiferae* or catkin bearers (*Betulaceae*, etc.) are regarded as being the most primitive and precede such primitive petaliferous families as *Ranunculaceae* and *Magnoliaceae*. †Bessey has shown in his comparison of the palaeontological researches of Schimper and Lesquereux, that in the Cretaceous period in North America, when the dicotyledonous flora is first recorded, there was actually a preponderance of petaliferous " Polypetalae." Bessey contends, therefore, and many botanists will agree with him, that polypetaly was earlier and that one of the first modifications of it was probably in the direction of apetaly, a condition reached by many plants in the earlier periods but by relatively smaller numbers at the present day.

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* For the convenience of students who may not be familiar with botanical latin I give the following translation of the above passage: " The family *Illecebraceae* is very closely allied to the *Amarantaceae*, but differs by having stipules, a herbaceous perianth and perigynous stamens. The *Caryophyllaceae* are distinguished by their petaliferous flowers, many ovuled ovary and capsular fruit; *Portulaceae* by their geminate sepals, by their corolla, and dehiscent capsule. The *Ficoideae* are connected through the genus *Adenogramma* which has a 1-celled ovary and basal ovule. The tribe *Scleranthеae* shows a transition to the *Caryophyllaceae*. The tribe *Molluginеae* of *Ficoideae* differs by its polycarpic ovary and very often hypogynous stamens.

† Bessey, Bot. Gaz. 24 : 151 (1897).

C. Robertson* has ably discussed the question of the primitive or non-primitive character of the "Amentiferae" group of *Apetalae*, on which the acceptance of Engler's views so much depends. He offers the theory that primitive Angiosperms were already entomophilous and that anemophilous types are metamorphosed entomophilous flowers resulting from reduction and degradation, and are not at all primitive. Probably too much importance has been attributed to the anemophily of the *Amentiferae*, on the false analogy of the *Gymnosperms*.

Regarding the origin of *Ranunculaceae* and allied families, after a careful examination of these groups, I find myself unable to accept Hallier's view† that the *Ranunculaceae* and *Nymphaeaceae* have descended from the *Magnoliaceae* through the *Schizandraceae*, *Lardizabalaceae* and *Berberidaceae*. It is a far cry indeed from a Buttercup to a Magnolia. To my mind the floral structure of *Berberidaceae* and *Lardizabalaceae* suggests evolution in entirely the opposite direction, *i.e.*, from the *Ranunculaceae*. There are many connecting links between the *Ranunculaceae* and the *Berberidaceae*, and the latter appear to be the reduced and more recent forms. The relative antiquity of woody and herbaceous plants has been the subject of a most interesting and instructive paper by Sinnott and Bailey,‡ whose researches go to show that in the flowering plants herbs, as a rule, have been derived from woody plants. However probable this may be, I do not think it can account for the origin of *Ranunculaceae* from any existing woody group. That herbs have been derived from ligneous types in certain families seems clear from some of the examples they quote, but it seems to me that the theory should be applied with considerable caution, for it is reasonable to suppose that the reverse may have frequently occurred, and that an herbaceous group may have evolved woody or semiwoody types. The study of this subject from both standpoints would no doubt be productive of interesting results. The type of wood peculiar to *Clematis*, *Berberis* and the *Menispermaceae* generally, may owe its peculiarity to derivation from *herbaceous* ancestors. From a consideration of floral structure and wide distribution the genus *Clematis* with its woody habit, opposite leaves, its induplicate-valvate sepals and apetalous condition, in conjunction with this view regarding the origin of woody structure, may be traced back through the intermediate genus *Clematopsis* (*Kew Bull.* 1920, 12–22) to the herbaceous and more primitive genus *Anemone*, by way of *Anemone* §*Pulsatilla*. There are wide gaps in the relationships of the

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* C. Robertson, The Structure of the Flowers and the Mode of Pollination of the Primitive Angiosperms: Bot. Gaz. 37: 294–298 (1904).

† H. Hallier, "Provisional Scheme of the Natural (Phylogenetic) System of Flowering Plants," in New Phytologist, 4: 151–162 (1905); see especially p. 157.

‡ E. W. Sinnott & I. W. Bailey, "The Origin and Dispersal of Herbaceous Angiosperms," in Ann. Bot. 28: 547–600 (1914).

genera of *Berberidaceae*, but the genus *Berberis* may perhaps similarly be traced through *Mahonia*, and some lost type of plant related to *Epimedium*, which is itself a highly evolved member of the family. And similar reasoning may be put forward regarding the origin of the *Menispermaceae* and *Aristolochiaceae*, where in the case of the latter family complete reduction of the inner perianth has been carried out, as in *Clematis*. It is significant that the production of peculiar woody structure in these groups should be accompanied by reduction and degradation of the flowers.

## Considerations for the delimitation of groups of families.

With the exception of the primary division into Dicotyledons and Monocotyledons, large groups are usually artificial, especially if the characteristic fixed upon to distinguish them is a general tendency and founded on a single character. Examples are the De Candollean artificial groups *Thalamiflorae*, *Disciflorae*, *Calyciflorae*, *Inferae* and to a less extent the *Parietales*, *Centrospermae* and *Amentiferae*. The special characteristics indicated by the names of some of these groups are general tendencies in many families of flowering plants. Although it is still very convenient to recognise two main groups of Dicotyledons as *Archichlamydeae* and *Metachlamydeae* (*Polypetalae* and *Gamopetalae*), a true phylogenetic classification would be better attained in which the gamopetalous character were regarded in its true light, *i.e.*, as a general tendency, for gamopetaly is quite a common feature in many so-called polypetalous families.* It is perhaps too early to suggest so revolutionary a change. The result, however, would be the closer approximation of such clearly related families as the *Anonaceae* and *Sapotaceae*, *Caryophyllaceae*, *Primulaceae* and *Gentianaceae*, the *Rhamnaceae* and *Myrsinaceae*, etc. In a new classification, therefore, smaller groups must be recognised, which are bound together by a combination of characters, and which allow the introduction of the general tendencies of floral development such, at any rate, as perigyny, epigyny and apetaly. For this reason I have proposed (*Kew Bull.* 1921, 185–191) the establishment of the order *Magnoliales* as distinct from *Ranales*, because I consider that they may have been evolved from separate primitive stocks developed on parallel lines, *i.e.*, with strobilus-like hypogynous polycarpellary flowers. The ultimate development of the more primitive families of these two groups, the *Magnoliaceae* and *Ranunculaceae* respectively, is entirely dissimilar, the one remaining entirely arboreal, the other mainly herbaceous. I am not sure that a third primitive group should not be recognised, say the *Dilleniales*, whence might be traced the *Ternstroemiales* and the vast domain of *Rosales* and "Amentiferae."

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* For example *Anonaceae*, *Meliaceae*, etc.

These are considerations, however, which may be better dealt with at the conclusion of our studies in order to avoid the error of making the facts fit the theory, a common tendency of modern times.

## Considerations for the delimitation of families.

A great divergence of opinion is evident in the two principal systems of classification in regard to the delimitation of families. Thus the number of families of flowering plants, including the Gymnosperms, in the Genera Plantarum is 200, in the Pflanzenfamilien 280, whilst the number is further increased in Engler and Gilg's Syllabus. There is much to be said in favour of reducing the size of families wherever reasonably possible, and I am in favour of going slightly further even than Engler. For instance, to include in the *Magnoliaceae* such distinct families as the *Winteraceae*, *Schizandraceae*, *Trochodendraceae*, *Himantandraceae*, and *Cercidiphyllaceae*, is decidedly incongruous. If these latter families are excluded the *Magnoliaceae* proper is a homogeneous group, the characters of which are easily grasped. A similar argument may be advanced for the segregation of *Papaveraceae* and *Fumariaceae*, the *Guttiferae*, *Quiinaceae* and *Eucryphiaceae*, the *Ternstroemiaceae*, *Marcgraviaceae* and *Caryocaraceae*, and many other families, even the *Leguminosae* into the *Mimosaceae*, *Caesalpiniaceae* and *Papilionaceae* (*Fabaceae*). On the other hand I should consider it going too far to divide the *Compositae* into the *Asteraceae*, *Vernoniaceae*, *Eupatoriaceae*, etc., whilst the wisdom of separating the *Rosaceae* into several families is rather doubtful. All this goes to prove that the delimitation of families, of genera, and of species is very much a matter of taste and personal idiosyncrasy. And it is on this account that the work of Bentham & Hooker carries perhaps more weight from being the production of a single pair of minds, than that of Engler & Prantl. who enlisted the services of a large number of botanists to carry out the work, resulting in a great diversity of treatment, especially as regards the genera.

## Considerations for the delimitation of genera.

The delimitation of genera is also very much a matter of taste and personal opinion, even more so than in the case of species. Sometimes the differences between certain genera of a family are not of a very pronounced type, whilst other groups more easily distinguished are treated as sections of one genus. No hard and fast rule for distinguishing genera is possible. For instance, many reduced to synonymy by Bentham and Hooker have been restored to generic rank, often for very good reasons. The genus *Mahonia* is now generally recognised as being quite distinct from *Berberis*, to quote a familiar example. The present writer has restored the genus *Plagiorhegma*, from Manchuria

(see *Kew Bull.* 1920, 242), because it is as distinct from *Jeffersonia* (N. America) as any other two genera of *Berberidaceae* are from each other. The restoration or amalgamation of genera, however, should as a rule not be attempted unless an author has made a thorough study of the whole group or family to which they belong. Authors of small local floras often attempt to split up genera, because in the particular area dealt with they appear to be easily separable. Thus in the Flora of Gibraltar (Journ. Bot. 1914, suppl. 56) several species are separated from *Chrysanthemum* as genera which are scarcely distinguishable even as sections. A study of the world species of the genus *Chrysanthemum* would have shown these genera to be untenable. From our point of view Small's otherwise most excellent Flora of the South-Eastern United States suffers from an excessive segregation of genera, often distinguished on trifling characters. On the whole, however, botanical science in respect of genera suffers less than most other branches of natural history. If one may pick out amongst many others a good example of a local flora one might select Cheeseman's well known Flora of New Zealand, a book which in regard to its genera conforms to standard works.

There is a good example of the above question in the family *Ranunculaceae.* In regard to the limits of the genus *Anemone,* there has been no agreement amongst authors. I think there is a good case for recognising *Hepatica* as a separate genus (*cf.* key on p. 85) and I have accepted the South American segregates which have been the subject of a paper by Britton (see p. 88), *i.e.*, *Capethia,* which has no involucre, *Barneoudia,* with a remarkable fleshy cyathium-like involucre close up to the flower, and the North American *Syndesmon,* with long-petiolate leaves each of which subtends a flower. After a careful examination of all the species, however, I find myself unable to uphold *Pulsatilla* as a separate genus. Britton (l.c.) says in regard to this question :—"There is perhaps less reason for keeping *Anemone* and *Pulsatilla* distinct than for separating *Hepatica,* but I find no transitions from *Pulsatilla* to *Anemone,* and it forms a very natural group of species both as to structure, habit, and geographical distribution throughout the North temperate zone." Amongst the old-world species, however, there are intermediate species. The well known garden plant, *A. hortensis,* has a short style. *A. palmata* a style 4–5 mm. long, as has also *A. glaucifolia ;* but it is in the African species that the best intermediate examples occur. In *A. Thomsonii,* a high mountain species from East Tropical Africa (9000–13000 ft.), the style is not that of § *Pulsatilla,* but the involucre is pectinate as in that section, whilst *A. capensis* shows the reverse, *i.e.*, a long style and a normal leafy involucre; the latter characteristics are also shown by *A. Fanninii,* Harv., a Natal species.

I give below the general principles of classification which I have adopted in arranging the genera of plants in each family.

As Bessey* says they are generally accepted principles as applied to flowering plants, at any rate with those who believe that petaliferous plants preceded apetalous ones and that the latter have arisen through reduction.

### *General principles adopted for the classification of flowering plants.

Other things being equal, it may be stated that :—

(1) Evolution is both upwards and downwards, the latter involving degradation and degeneration ; examples : —the apetalous state of many flowers ; unisexuality in flowering plants.

(2) Evolution does not necessarily involve all organs of the plant at the same time, and one organ or set of organs may be advancing whilst another set is stationary or retrograding.

(3) Evolution has generally been consistent, and when a particular progression or retrogression has set in it is persisted in to the end of the phylum ; examples :— the strong tendency to zygomorphy of the corolla coupled with the reduction in the number of stamens in the hypogynous *Metachlamydeae ;* the great tendency to perigyny and epigyny in the *Archichlamydeae* and *Metachlamydeae*, as exhibited in the families *Umbelliferae* and *Rubiaceae* respectively.

Relating to the general habit of plants.

(4) In certain groups, trees and shrubs are probably more primitive than herbs ; examples, *Mimosaceae* and *Caesalpiniaceae* (trees and shrubs) as compared with the derived family *Papilionaceae* (*Fabaceae*) (mostly herbaceous).

(5) Trees and shrubs are older than climbers, the latter habit having been acquired through particular environment.

(6) Perennials are older than biennials, and from them annuals have been derived ; note the extraordinarily few annuals in the primitive family *Ranunculaceae ;* the great number in the *Cruciferae.*

(7) Aquatic Phanerogams are as a rule more recent than terrestrial (at any rate in the members of the same family or genus), and the same may be said of epiphytes, saprophytes, and parasites.

Relating to the general structure of flowering plants.

(8) Plants with collateral vascular bundles arranged in a cylinder (Dicotyledons) are more primitive in origin

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* The reader is referred here to a second essay by Bessey, "Phylogenetic Taxonomy," published in the Annals of the Missouri Botanic Garden, vol. 2 : 112. The present writer cannot accept all Bessey's generalisations, but his principles are given above together with a few additional observations.

than those with scattered bundles (Monocotyledons), though it does not necessarily follow that the latter have been directly derived from the former.

(9) The spiral arrangement of leaves on the stem and of the floral leaves precedes that of the opposite or whorled type.

(10) As a rule simple leaves precede compound leaves.

Relating to the flowers and fruits of plants.

(11) Bisexual (hermaphrodite) preceded unisexual flowers, and the dioecious is probably more recent than the monoecious condition.

(12) The solitary flower is more primitive than the inflorescence, the highest forms of the latter being the umbel and capitulum :—examples of the latter, *Umbelliferae*, *Compositae*.

(13) Spirally arranged floral parts are more primitive than whorled and valvate : examples *Ranunculus* and *Clematis*.

(14) Many-parted flowers (polymerous) precede, and the type with few parts (oligomerous) follows from it, being accompanied by a progressive sterilization of reproductive parts (sporophylls).

(15) Petaliferous flowers precede apetalous ones. the latter being the result of reduction.

(16) Free petals (polypetaly) are more primitive than connate petals (gamopetaly).

(17) Actinomorphy (regularity) of the flower is an earlier type than zygomorphy (irregularity) ; examples *Caltha* and *Delphinium*.

(18) Hypogyny is the primitive structure and from it perigyny and epigyny were derived later.

(19) Free carpels (apocarpy) are more primitive and from them connate carpels resulted ; sometimes however, when the carpels have remained loosely united during evolution they may again become quite free.

(20) Many carpels (polycarpy) preceded few carpels (oligocarpy) ; examples *Ranunculus* and *Nigella*.

(21) The endospermic seed with small embryo is primitive and the non-endospermic seed higher :—examples *Ranunculaceae* and *Rosaceae*.

(22) In the primitive flowers there are many stamens, in the higher flowers few stamens :—*Ranunculus* and *Cheiranthus*. This condition may, however, be reversed in response to the needs of insect life within the confines of a single family like *Papaveraceae*, where bees feed on the pollen.

(23) Separate stamens preceded connate stamens ; examples *Campanulaceae* and *Lobeliaceae*.

(24) Aggregate fruits are more recent than single fruits and as a rule the capsule precedes the drupe or berry.

## The genera of Ranunculaceae.

I give here a brief outline of the classifications of the genera of *Ranunculaceae* by the principal systematists of the last century.

Jussieu 1789. Jussieu (Genera Plantarum, 231) divided the 24 genera of *Ranunculaceae* into four groups.

I. **Fruits 1-seeded, indehiscent.**

II. **Fruits several-seeded, dehiscent on the inside. Petals irregular.**

III. **Fruits several-seeded, dehiscent on the inside. Petals regular.**

IV. Ovary one. Berry 1-celled, many-seeded.

In his first group we find the genera *Clematis*, *Atragene*, *Thalictrum*, *Hydrastis*, *Anemone*, *Hamadryas*, *Adonis*, *Ranunculus*, *Ficaria*, *Myosurus*.

In the second group :—*Trollius*, *Helleborus*, *Isopyrum*, *Nigella*, *Garidella*, *Aquilegia*, *Delphinium*, *Aconitum*.

In the third group :—*Caltha*, *Paeonia*, *Xanthorrhiza*, *Cimicifuga*.

In the fourth group :—*Actaea* and *Podophyllum*.

From this list it is clear that Jussieu had a very good idea indeed of classification. His term "irregular" in regard to petals, however, was not strictly applied to the zygomorphic flower as we recognise it at the present day, for it included the actinomorphic flowered *Trollius*, *Helleborous*, *Isopyrum*, *Nigella*, *Garidella* and *Aquilegia*, as well as the truly zygomorphic flowered genera *Delphinium* and *Aconitum*.

Jussieu's fourth group need not be considered here, *Podophyllum* being now assigned to the *Berberidaceae*.

De Candolle 1818. De Candolle (Systema Naturale 1. 127) arranged the family into two main groups.

I. *Ranunculaceae Verae*. II. *Ranunculaceae Spuriae*.

Group I. was divided into four tribes more or less as we know them to-day :—

1. *Clematideae* ; 2. *Anemoneae* ; 3. *Ranunculeae* ; 4. *Helleboreae*. His "spurious" *Ranunculaceae* were *Actaea*, *Xanthorrhiza*, and *Paeonia*. This classification was adhered to in his Prodromus (i. 2. (1824) ) except that the "spurious" genera were included in a fifth tribe, *Paeoniaceae*, with a remark as to whether it should not constitute a distinct family. It is interesting to note that already in 1824 there were known 90 species of *Clematis*, 52 species of *Thalictrum*, 49 species of *Anemone*. 159 species of *Ranunculus*, 53 species of *Delphinium* and 22 species of *Aconitum*. At that time the number of species known for these genera totalled 425, and Bentham & Hooker's estimate 44 years later added only 13 more. The estimate for these genera in the present paper is 1290 species, which shows a great increase in our knowledge during recent years.

Endlicher 1839. Endlicher (Genera Plantarum 843) followed closely De Candolle's classification of the family, recognising a number of small genera, and remarking on the artificiality of the tribe *Paeonieae*, which he rather increased by the inclusion of *Trautvetteria*.

Bentham & Hooker 1862. Bentham & Hooker (Genera Plantarum i. 1) adhered closely to the arrangement of De Candolle. They placed the so-called spurious genera *Actaea* and *Xanthorrhiza* in the subtribe *Cimicifugeae* of the tribe *Helleboreae* and wisely limited *Paeonieae* to the genus *Paeonia*.

Baillon 1867. Baillon (Histoire des plantes i. 1.) classified *Ranunculaceae* in four tribes I. *Aquilegieae*, II. *Ranunculeae*, III. *Clematideae*, IV. *Paeonieae*, beginning with the genus *Aquilegia* and ending with *Crossosoma*, the latter now being regarded as a distinct family, the *Crossosomataceae*, more closely related to the *Dilleniaceae* and *Rosaceae*.

Prantl 1888. Prantl (Engler & Prantl, Natürl. Pflanzenf. iii. 2 : 54) divided the family into three main tribes, I. *Paeonieae*, II. *Helleboreae*, III. *Anemoneae*.

By over-emphasizing the importance of the relative lengths of the outer and inner seed coats, he associated in the tribe *Paeonieae* such divergent genera as *Glaucidium*, *Hydrastis* and *Paeonia*, thus rendering the tribe a most unnatural one. Another character used by Prantl for further subdividing his tribes into groups, namely, the presence of one or two integuments in the ovule, led to further artificiality, such genera as *Thalictrum* and *Adonis* being associated by this character alone. Further, Prantl's reductions of several distinct and well-defined genera such as *Knowltonia* to *Anemone*, *Naravelia* to *Clematis*, and *Cimicifuga* to *Actaea*, have not been generally accepted.

From our point of view there is little evidence of a phylogenetic arrangement in any of the above classifications, De Candolle's system beginning with the highly evolved and reduced genus *Clematis*, and Baillon's with the highly specialized genus *Aquilegia*. There appear to be two distinct phylogenetic groups in the family which for convenience may well be regarded as subfamilies. Of these the structure of the flowers of the *Helleboroideae*, and especially in regard to its gynaecium, is probably the more ancient, the often green leaf-like carpels corresponding to our conception of a primitive type. In this subfamily there is a remarkable range in floral structure from an apparently primitive genus such as *Helleborus* to a so highly evolved and specialized zygomorphic type of flower as is found in *Aconitum* and *Delphinium*. The best position for the *Paeonieae* remains a problem. I consider it to be an isolated type and have placed it first, as it shows no clear connection between the two other tribes. The second subfamily, *Ranunculoideae* with its achenial

1-seeded carpels, may, it is suggested, have been derived from the *Helleboroideae ;* or more likely it may have had a separate origin from some (at present) unknown group. At any rate the *Helleboroideae* approaches the *Ranunculoideae* closely in the neighbourhood of the genera *Isopyrum* and *Enemion*, wherein the ovules are sometimes reduced to a very small number. Below is given a diagram showing the approximate relationships of the principal groups and linking genera of the family *Ranunculaceae.*

Bentham & Hooker's classification began with the genus *Clematis* and ended with *Paeonia.* We now reverse this arrangement. Tribes *Paeonieae*, *Helleboreae* and *Clematideae* remain more or less as defined by Bentham & Hooker. As noted above, Prantl (Engler & Prantl, Pflanzenfamilien, iii. ii. 54) included the genera *Glaucidium* and *Hydrastis* in the tribe *Paeonieae*, determined mainly on characters derived from the relative lengths of the outer and inner seed coats. I think this feature has been much over-emphasized and in this case has led to an unnatural collection of very different types. *Paeonieae* is therefore treated here as being generically monotypic. Worsdell,* mainly on anatomical grounds, considers it to be worthy of taking family rank. From a taxonomic point of view, however, I think this is scarcely practicable. For similar reasons Engler's removal of *Hydrastis* to *Berberidaceae* is not acceptable. Its numerous carpels and longitudinally dehiscent anthers seem to destroy entirely the homogeneity of that family (I exclude from *Berberidaceae* the *Lardizabalaceae*) and it is much better placed in the *Ranunculaceae*, to which most previous authorities have referred it. I have ventured to recast tribes *Ranunculeae* and *Anemoneae*, separated by Bentham & Hooker on the position of the ovule and merged by Prantl into one tribe, on more natural lines, determined by the absence or presence of the involucre of leaves below the flower, so constant a characteristic (associated with apetaly) of the large and natural genus *Anemone.* For this reason the genera *Thalictrum*, *Knowltonia*, *Adonis*, *Callianthemum* and *Myosurus* are transferred from *Anemoneae* to *Ranunculeae*, to which they seem more closely related by characters other than the position of the ovule. The genus *Syndesmon* links these two tribes just as *Clematopsis* (*Kew Bull.* 1920, 12) connects *Anemoneae* through *Anemone* § *Pulsatilla* with *Clematideae. Delphineae*, hitherto regarded as a subtribe of *Helleboreae*, is here raised to tribal rank. In a primitive group like the *Ranunculaceae* the remarkably specialised and advanced type of floral structure shown in the zygomorphic flowered *Delphinium* and *Aconitum* should be regarded as a character of primary importance in classification. The seeds, too, are very distinctive in the group.

The most highly specialised types of perianth occur, then, in the genera *Aquilegia*, *Aconitum* and *Delphinium*, whilst the

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* W. C. Worsdell, "The Affinities of Paeonia" in Journ. Bot. 46 : 114–116 (1908); see also the same author on "A Study of the Vascular System in certain Orders of the Ranales" in Ann. Bot. 22 : 663 (1908).

greatest reduction is shown in *Anemone*, *Clematopsis*, *Clematis*, and *Naravelia*, that of the latter two being valvate. Apetaly also occurs in *Enemion* which is clearly a mere reduction from *Isopyrum*.

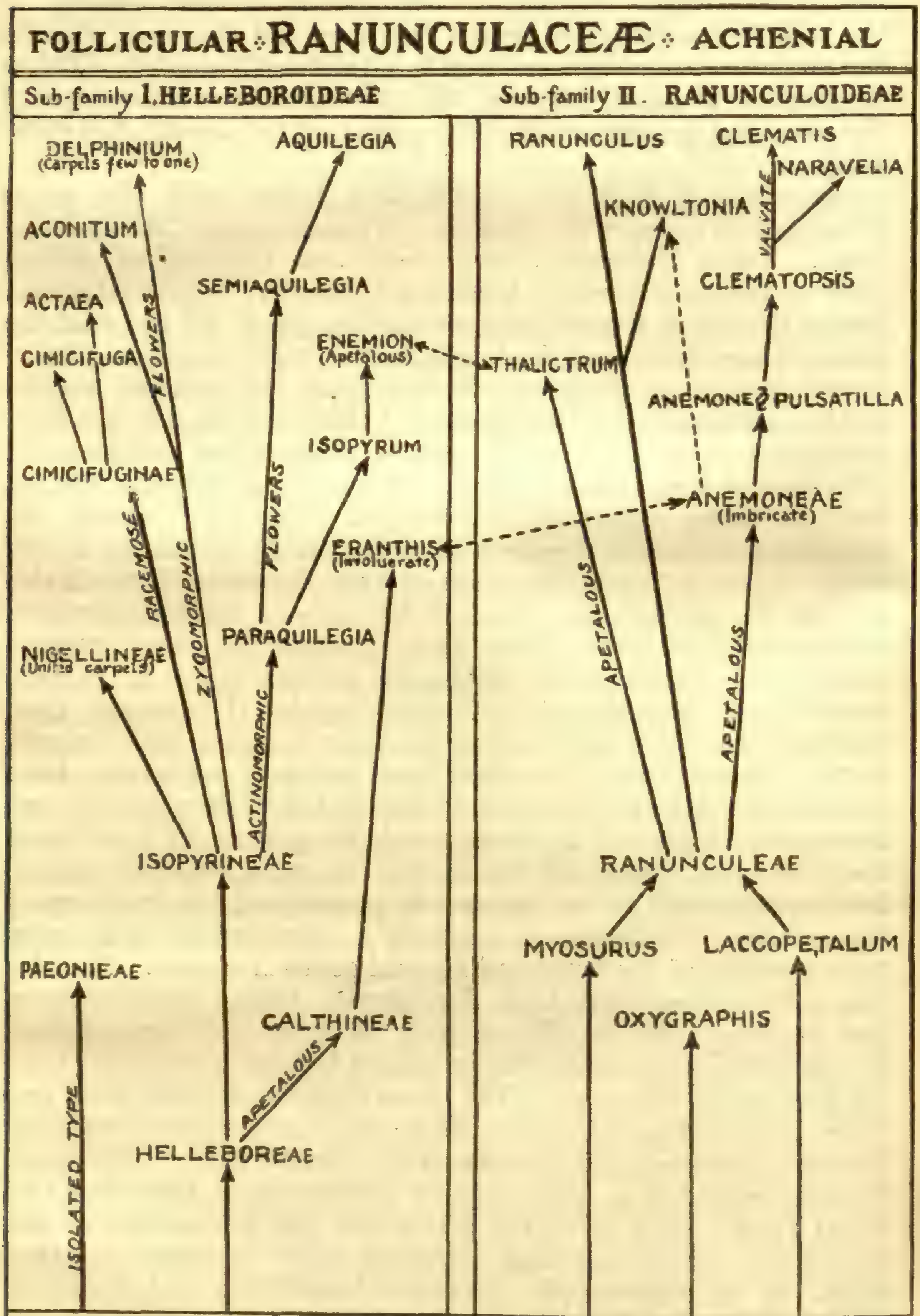



Diagram suggesting the possible course of evolution of the main groups and genera of the family *Ranunculaceae*. The dotted lines indicate genera showing parallel development in the two main groups. The distance from the base line is a rough indication of the relative primitiveness of each group, the basal groups of the *Helleboroideae* being considered more primitive than those of the *Ranunculoideae*.

These genera appear therefore to be amongst the most lately evolved of the *Ranunculaceae*, and they are moreover the most widely spread, the first three terminating a phylum composed of Tribes *Helleboreae* and *Delphineae*, characterised by follicular many-seeded carpels, the others, with a single perianth, ending a second phylum composed of Tribes *Ranunculeae*, *Anemoneae* and *Clematideae*, characterised by achenial 1-seeded carpels. It seems probable that apparent affinity between genera in the two groups is due to parallel evolution. Of the *Helleboreae*, for instance, the small apetalous-flowered genus *Enemion* has sometimes only one seed in its follicular fruit, obviously the result of reduction and it approaches very closely some species of *Thalictrum* of the *Ranunculeae*. Apart from this degraded *Enemion* type of flower, however, the tribe *Helleboreae* appears to have developed very specialised types of inflorescence and flowers and to have produced in one direction the subtribe *Cimicifuginae*, in another the genus *Aquilegia* through *Paraquilegia* and *Semiaquilegia*, whence also the tribe *Delphineae* may also owe its origin, whilst *Ranunculeae* have culminated in the apetalous groups *Anemoneae* and *Clematideae* as already noted.

It should be remarked that coincident with the reduction of one whorl of the perianth we have the singular aggregation of the upper leaves into a protective involucre so marked a feature of tribe *Anemoneae*, as if to compensate for the apetalous condition. Thus the involucre comes to function as an ordinary calyx, and is scarcely distinguishable from such in the genera *Hepatica* and *Barneoudia*. With the assumption of the climbing shrubby habit in *Clematis*, wherein it was no longer required on account of this new mode of growth, the involucre seems to have been dispensed with. Its retention in some of the species of *Clematopsis*, an intermediate genus, is noteworthy.

The elongated carpellary axis of *Myosurus*, recalling as it does the cone-like structure of the more primitive *Magnoliaceae*, must, having regard to the saccate sepals, be looked upon as a primitive feature retained in or perhaps returned to this genus. In another direction, namely, in having broadly-winged seeds contained in two partially connate carpels, the genus *Glaucidium* departs markedly from the usual type of carpellary structure, the general habit of this plant suggesting affinity with *Podophyllum* in the *Berberidaceae*.

## Geographical distribution of Ranunculaceae.

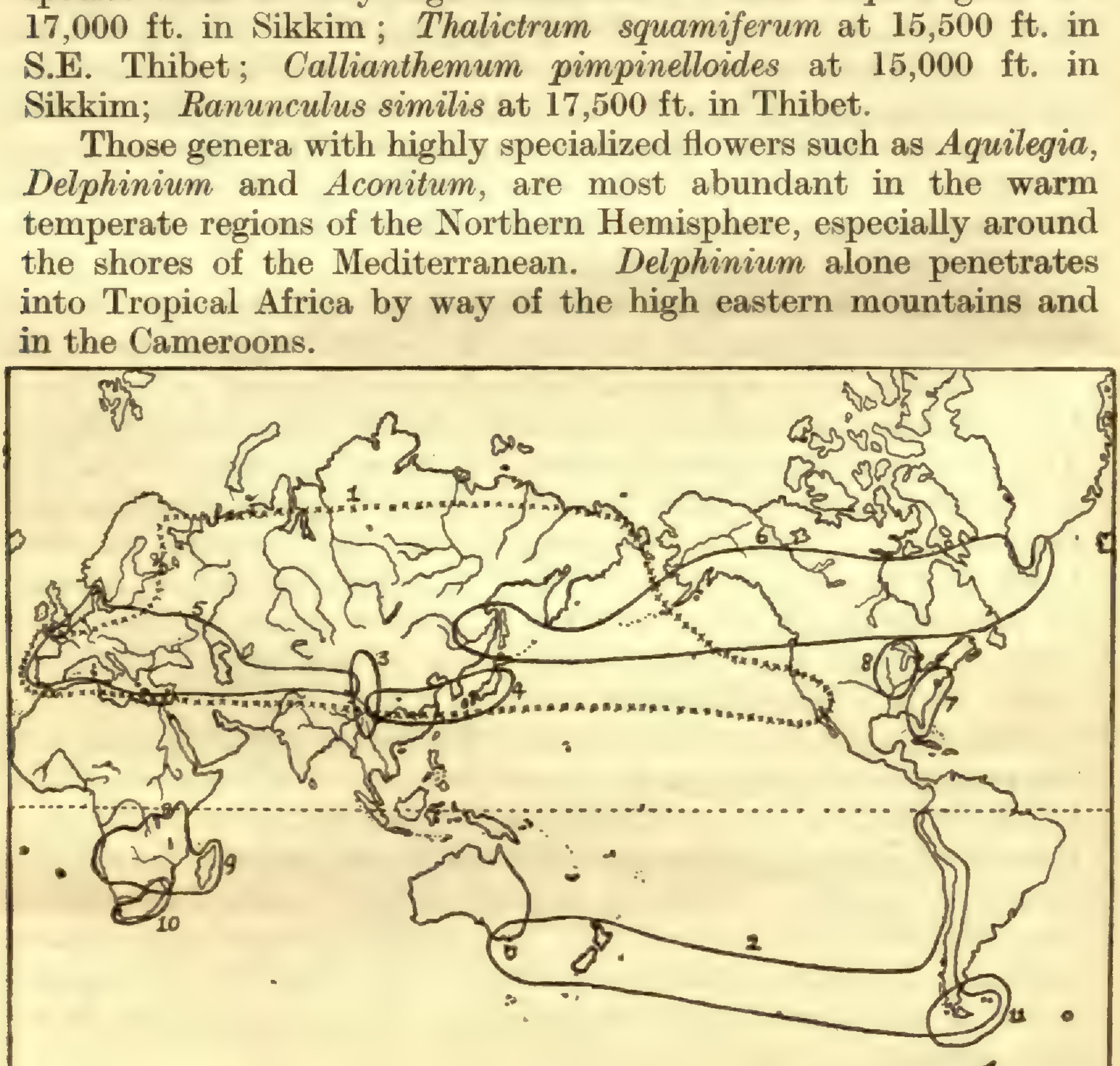
*Ranunculaceae* are to be found in nearly every part of the globe. They are relatively most abundant, both in species and individuals, in the temperate regions of the Northern Hemisphere, and are comparatively rare in the tropics, there found mainly on the mountains and high plateaux.

In Lapland* the family represents about $\frac{1}{24}$ of the total phanerogamic vegetation. The most widely spread species in

* Lecoq, Geogr. Bot. 4: 404 (1855).

the family include the following: *Ranunculus aquaticus* (sensu lato), *R. repens*, *R. flammula*, *R. arvensis*, *R. acris*, *R. auricomus*, *R. bulbosus*; *Caltha palustris*; *Hepatica triloba*; *Anemone nemorosa*; *Thalictrum flavum*; *Aquilegia vulgaris*; *Anemone ranunculoides*; *Delphinium consolida*; *Myosurus minimus*. Some species occur only in or near the Arctic Zone or near the snow-line of high mountains; amongst the former are *Caltha natans*, *Coptis trifolia*, *Ranunculus affinis*, *R. lapponicus*, *R. Pallasii*, *R. samojedorum*, *R. sulphureus*. Interesting cases of discontinuous distribution are afforded by *Ranunculus pygmaeus*, in Arctic Europe and in S.E. Tyrol (8,000 ft.), and *R. hyperboreus*, Arctic Europe and in the Himalaya (15,000–17,000 ft.). Some species occur at very high elevations. *Caltha scaposa* grows at 17,000 ft. in Sikkim; *Thalictrum squamiferum* at 15,500 ft. in S.E. Thibet; *Callianthemum pimpinelloides* at 15,000 ft. in Sikkim; *Ranunculus similis* at 17,500 ft. in Thibet.

Those genera with highly specialized flowers such as *Aquilegia*, *Delphinium* and *Aconitum*, are most abundant in the warm temperate regions of the Northern Hemisphere, especially around the shores of the Mediterranean. *Delphinium* alone penetrates into Tropical Africa by way of the high eastern mountains and in the Cameroons.




Map showing the approximate distribution of some genera of Ranunculaceae:—

1. Paeonia. 2. Caltha § Psychrophila. 3. Souliea. 4. Glaucidium. 5. Helleborus. 6. Coptis. 7. Trautvetteria. 8. Hydrastis. 9. Clematopsis. 10. Knowltonia. 11. Hamadryas.

The *Ranunculaceae* of the Southern Hemisphere are rather peculiar, and a study of their structure and affinities suggests that they may be only the remnants of a greater *Ranunculaceous* flora which has almost disappeared. Thus there are remarkably distinct species of *Anemone* in the mountains of South Africa.

*Clematopsis* occupies the old African plateau and Madgascar, and a peculiar development of *Anemone*, the genus *Knowltonia*, is endemic to the Cape. The dioecious *Hamadryas*, the genus *Barneoudia*, another clear offset of *Anemone*, *Capethia*, and the recently described and evidently primitive genus *Laccopetalum* are confined to the Southern Andes and the extreme southern parts of S. America. The genus *Caltha* is readily split into two groups, both structurally and geographically, § *Populago*, with 15 species in the Northern Hemisphere, and § *Psychrophila* (see map) with 7 species in the Andes of S. America, 2 species in New Zealand, 1 in Tasmania and 1 in South East Australia. Of especial interest is the distribution of the genus *Coptis* (see map), from Eastern China and Japan across the colder parts of North America to the shores of Greenland, and the genus *Paeonia* (see map), which extends from Western Europe eastwards into California, but is entirely absent from Atlantic N. America.

## Key to the tribes of Ranunculaceae.

Ovaries with more than 1 ovule; fruits follicular or baccate - Subfamily I. Helleboroideae.

Flowers actinomorphic;

Petals large and showy; carpels surrounded at the base by a fleshy disk - - - - - - I. Paeonieae.

Petals small and narrow or imperfect or absent; no disk - - - - II. Helleboreae.

Flowers zygomorphic; seeds often transversely ridged with scales or winged III. Delphineae.

Ovaries with 1 ovule; fruit a bunch of dry achenes, very rarely baccate

Subfamily II. Ranunculoideae.

Leaves alternate; sepals imbricate

Flowers not subtended by an involucre of leaves; calyx mostly caducous; petals mostly present - - - IV. Ranunculeae.

Flowers subtended by an involucre of leaves remote from the calyx, the latter mostly coloured and persistent at flowering time; petals absent - - - - - V. Anemoneae.

Leaves opposite; sepals induplicate-valvate or rarely partly imbricate; petals absent or represented by outer staminodes - - - - VI. Clematideae.

## Key to the Genera.

Tribe I. Paeonieae. Monotypic - - 1. **Paeonia.**

Tribe II. Helleboreae.

*Flowers solitary, rarely few and subpaniculate, never racemose.

†Leaves palmately nerved or palmately divided - - - - - Subtribe CALTHINAE.
Petals present, usually much reduced and nectariferous :
Upper leaf-segments not forming an involucre below the flower :
Sepals usually deciduous :
Petals several; leaves not peltate - - - - 2. **Trollius.**
Petals 5, club-shaped; leaves peltate - - - - 3. **Asteropyrum.**
Sepals persistent, broad; petals trumpet-shaped or much reduced - - - - 4. **Helleborus.**
Upper leaf-segments forming an *involucre* below the flower - 5. **Eranthis.**
Petals absent :
Ovules several, in 2 or more rows; fruits dehiscent :
Seeds not winged; carpels more than 2 :
Ovules arranged all along the ventral suture of the carpel - - - - 6. **Caltha.**
Ovules arranged near the base of the carpel - - - 7. **Calthodes.**
Seeds broadly winged; carpels 2 8. **Glaucidium.**
Ovules 2 in each carpel, the latter baccate and becoming connate 9. **Hydrastis.**

††Leaves ternately or somewhat pinnately compound :
‡Carpels quite free from one another Subtribe ISOPYRINAE.
Staminodes absent :
Petals present :
Sepals and petals numerous; seeds scaly - - - 10. **Anemonopsis.**
Sepals 5–6 :
Carpels more than 2 :
Carpels sessile :
Caespitose perennials; carpels about 5; petals not tubular 11. **Paraquilegia.**
Annuals; carpels about 12; petals tubular 12. **Leptopyrum.**
Carpels stipitate - - 13. **Coptis.**
Carpels 2, divaricate - - 14. **Isopyrum.**
Petals absent - - - - 15. **Enemion.**

Staminodes present within the stamens, flat and membranous; petals saccate or spurred;
- Petals saccate at the base - 16. **Semiaquilegia.**
- Petals spurred at the base - 17. **Aquilegia.**

‡‡Carpels more or less united, especially in fruit - - - Subtribe NIGELLINAE.

Carpels with long beaks; sepals petaloid, clawed; petals smaller than the sepals - - - - 18. **Nigella.**

Carpels not or scarcely beaked; sepals not clawed:

Sepals coloured and more conspicuous than the petals without transverse markings - 19. **Komaroffia.**

Sepals less conspicuous than the long clawed transversely marked petals - - - 20. **Garidella.**

**Flowers numerous, racemose or racemose-paniculate - - - Subtribe CIMICIFUGINAE.

Leaves orbicular, palmately nerved - 21. **Beesia.**

Leaves much divided:

Stamens more than 10; herbaceous-plants:

Carpels dehiscent:

Inflorescence few-flowered; leaves vaginate - - - 22. **Souliea.**

Inflorescence many-flowered - 23. **Cimicifuga.**

Carpels baccate, solitary - - 24. **Actaea.**

Stamens 5 or 10; carpels dehiscent; a low subshrub - - - 25. **Xanthorrhiza.**

Tribe III. DELPHINEAE.

Posterior sepal spurred at the base - - 26. **Delphinium.**

Posterior sepal hooded at the apex - - 27. **Aconitum.**

Tribe IV. RANUNCULEAE.

Sepals minutely spurred at the base; carpellary axis elongated in the flowering stage; leaves linear - - 28. **Myosurus.**

Sepals not spurred; carpellary axis mainly short or elongated only in fruit:

*Petals present :
Flowers hermaphrodite :
Carpels in several series; stamens usually numerous :
Sepals persistent; petals numerous - - - - 29. **Oxygraphis.**
Sepals caducous or deciduous; petals usually 5 :
Petals with several nectaries on the limb - - - 30. **Laccopetalum.**
Petals with a single (rarely up to 3) nectary at the base or on the claw :
Ovule pendulous; radical leaves much divided - 31. **Callianthemum.**
Ovule ascending; radical leaves usually not much divided - - - 32. **Ranunculus.**
Petals not nectariferous :
Carpels not baccate; style persistent - 33. **Adonis.**
Carpels baccate; style deciduous - - 34. **Knowltonia.**
Carpels in a single series, spreading stellately in fruit; stamens 10 35. **Gampsoceras.**
Flowers dioecious :
Sepals persistent; petals inconspicuous, green; leaves spathulate; Himalaya - 36. **Paroxygraphis.**
Sepals caducous; petals conspicuous; leaves various; extra-trop. S. America - 37. **Hamadryas.**

**Petals absent :
Flowers not solitary or scapose :
Ovule ascending - - - - 38. **Trautvetteria.**
Ovule pendulous - - - - 39. **Thalictrum.**
Flowers solitary on a scape :
Leaves digitately partite; sepals 5; Thibet - - - - 40. **Kingdonia.**
Leaves entire; sepals 10–15; Peru - - - - 41. **Capethia.**

Tribe V. ANEMONEAE.
Involucral leaves numerous, long-stalked; tuberous roots; N. Amer. - - 42. **Syndesmon.**
Involucral leaves mostly 3, sessile or nearly so :
Involucral leaves remote from the calyx and not calycine (*cf.* also No. 34 *Knowltonia*, with baccate fruit and deciduous style) - - 43. **Anemone.**

Involucral leaves close up to the calyx and composed of 3 sepal-like leaves — 44. **Hepatica.**
Involucre cyathiform, palmately lobed, close up to the calyx - - - — 45. **Barneoudia.**

Tribe VI. CLEMATIDEAE.

Sepals half imbricate and half induplicate —valvate or wholly imbricate; stems subsimple from a rhizome - — 46. **Clematopsis.**

Sepals induplicate-valvate :

Leaves variously compound or entire, none of the leaflets ever tendriliform, the petiole (when habi'. climbing) sensitive to contact; petals when present clearly staminodal - - - - - - — 47. **Clematis.**

Leaves trifoliolate, the terminal leaflet tendriliform and 3-pronged; petals linear or spathulate, sharply differentiated from the stamens - — 48. **Naravelia.**

Enumeration of *Ranunculaceae* showing the distribution and type species* of each genus and useful taxonomic literature.† Only those generic synonyms are included which are additional to the Genera Plantarum.

## Tribe I.—PAEONIEAE.

1. **Paeonia** *Linn.*—about 35 species in the North Temperate Zone; absent from Eastern North America; type species *P. officinalis*. For critical determinations of species carried out by Dr. Stapf, see Herb. Kew. For East Asian spp. see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 523–527 (1904).

## Tribe II.—HELLEBOREAE.

2. **Trollius** *Iinn.*—about 20 species in North Temperate Zone; type species *T. europaeus*, Europe; genus ascends to 11000 ft. in Yunnan (*T. patulus*), to 12000 ft. in Szechuan (*T. ranunculoides*) to 14000 ft. in the N.W. Himalaya (*T. acaulis*) and to 14000 ft. in Sikkim (*T. pumilus*). For East Asian spp. see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 393–396 (1904).
3. **Asteropyrum** *Drumm. et Hutchinson* in *Kew Bull.* 1920 : 155, fig. 1.——1sp., *A. peltatum*, Western China.

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* For rules relating to the selection of type species see Science, n.s., 53 : 312–314 (1921).

† Only such literature as the writer has met with in his work is quoted under each genus; no selection and no attempt at a complete bibliography has been made.

4. **Helleborus** *Linn.*—18 species, mainly South East Europe; type species *H. niger*, S.E. Europe; genus reaches its eastern limit in Thibet with the rare and beautiful *H. thibetanum*.——Revision by Schiffner in Engl. Bot. Jahrb. 11 : 92–122 (1889).
5. **Eranthis** *Salisb.*—7 species, Europe and North Asia; type species *E. hiemalis*, Cent. and S. Europe, Asia Minor.—— Revision by Huth in Engl. Bot. Jahrb. 16 : 293–9 (1892).
6. **Caltha** *Linn.*—about 26 species; N. and S. Temperate and frigid Zones; distinct sections in each hemisphere; type species *C. palustris*; genus ascends to 17000 ft. in Sikkim (*C. scaposa*); section *Psychrophila* confined to Southern Hemisphere.——For East Asian spp. see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51; 388–390 (1904). For section *Psychrophila* see A. W. Hill, "Caltha in the Southern Hemisphere", in Ann. Bot. 32 : 421–435 (1918).
7. **Calthodes** *Hook. f. et Thoms.*—3 species, S.E. Central Asia; type *C. palmata*, Sikkim.
8. **Glaucidium** *Sieb. et Zucc.*—2 species, China and Japan; type species *G. palmatum*, Japan.——See Huth in Engl. Bot. Jahrb. 16 : 290–1 (1892), and Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 391–3 (1904).
9. **Hydrastis** *Linn.*—1 species, *H. canadensis*, Atlantic North America.——See Huth in Engl. Bot. Jahrb. 16 : 291–3 (1892).
10. **Anemonopsis** *Sieb. et Zucc.*—1 species, *A. macrophylla*, Japan.
11. **Paraquilegia** *Drumm. et Hutchinson* in *Kew Bull.* 1920 : 156, fig. 2.——4 species, S. Central Asia; type species *P. grandiflora*, N. W. Himal. to W. China.
12. **Leptopyrum** *Reichb.*—1 species, *L. fumarioides*, Cent. and N. E. Asia, naturalised in Europe.——See Drumm. & Hutchinson in *Kew Bull.* 1920 : 159, f. 3.
13. **Coptis** *Salisb.* (incl. *Chrysocoptis* Nutt.).——9 species, N. Hemisphere; type species, *C. trifolia* Salisb., Amur and N. Japan through N. Amer. to Greenland; genus ascends to 12000 ft. in Sikkim (*C. ospriocarpa*). For East Asian species see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 399–402 (1904).
14. **Isopyrum** *Linn.*—12 species, N. Hemisphere except America; type species *I. thalictroides*, French Alps to Poland; genus ascends to 8000 ft. in Sikkim (*I. adiantifolium*). See Drumm. & Hutchinson in *Kew Bull.* 1920 : 161, figs. 5–6.
15. **Enemion** *Raf.*——5 species, E. Asia and N. America; type species *E. biternatum*, Cent. & S. E. North America.—— See Drumm. & Hutchinson in *Kew Bull.* 1920 : 159, fig. 4.
16. **Semiaquilegia** *Makino*, Bot. Mag. Tokyo, 16 : 119 (1902).—— 4 species, China and W. N. America.——type species *S. adoxoides*, China, Corea, Japan.——See Drumm. & Hutchinson in *Kew Bull.* 1920 : 165.

17. **Aquilegia** *Linn.*—about 80 species, N. Hemisphere; species differ slightly and are often little more than local forms; type species *A vulgaris*, Europe.——For East Asian species see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51; 410–414 (1904). N. Amer. spp. E. B. Payson, Contrib. U. S. Nat. Herb. 20 : 133–157, tt. 8–14 (1918).
18. **Nigella** *Linn.*—20 species mainly Mediterranean, type species *N. arvensis*, Europe.
19. **Komaroffia** *O. Kuntze*, in Act. Hort. Petrop. 10 : 144 (1887). ——2 species, *K. integrifolia*, *K. diversifolia*, Afghan. & Turkestan.
20. **Garidella** *Linn.*—2 species, North and Eastern Mediterranean; type species *G. Nigellastrum*, Spain to Caucasus. *G. unguicularis*, Syria & Palest.——Boiss. Fl. Or. 1 : 64 (1869).
21. **Beesia** *Balf. f. et W. W. Sm.* in Notes Roy. Bot. Gard. Edinb. 9 : 63 (1915).——1 species, *B. calthaefolia*, Western China and Thibet.
22. **Souliea** *Franch.* in Journ. de Bot. 12 : 68 (1898).——1 species, *S. vaginata*, Kansu to Yunnan, 9–13000 ft.——See Drumm. & Hutchinson in *Kew Bull.* 1920 : 167. f. 8.
23. **Cimicifuga** *Linn.*—3 species, N. Hemisphere; type species *C. foetida*, Europe to Siberia and Japan.——For East Asian species see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 519–523 (1904).
24. **Actaea** *Linn.*—about 6 species, Temp. N. Hemisphere; type species *A. spicata*, Eur.——See A. Gray Synop. Fl. N. Amer. 1 : I. 55 (1895) and Britton & Br. Fl. Un. St. & Canad. ed. II, 2 : 89 (1913).
25. **Xanthorrhiza** *L'Herit.*—1 species, X . *apiifolium*, Atlantic N. America.——Britt & Br. Fl. Un. St. & Canad. ed. II. 2 : 89 (1913).

### Tribe III.—Delphineae.

26. **Delphinium** *Linn.* (incl. *Ceratosanthus* Schur.)——about 230 species, N. Temperate Zone; type species *D. Consolida*, Europe & N. Asia.——For Oriental species see Boiss. Fl. Or. 1 : 72–94 (1867). N. Asian species, Ledeb. Fl. Ross. 1 : 58 (1842). East Asian species, Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 461 (1904).
27. **Aconitum** *Linn.*—about 250 species, N. Hemisphere; type species *A. lycoctonum*, N. Europe; for Oriental species see Boiss. Fl. Or. 1 : 94–96 (1867). For Indian species see Stapf, "Aconites of India" in Ann. Calc. Bot. Gard. 10 : 115–197, tt. 92–116 (1905). For East Asian species see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 498–518 (1904).

### Tribe IV.—Ranunculeae.

28. **Myosurus** *Linn.*—about 7 species, Cosmopolitan; type species *M. minimus* Eur. to N. Amer. and in Australia.——See revision by Huth in Engl. Bot. Jahrb. 16 : 281–86 (1892).

29. **Oxygraphis** *Bunge*.—3 species, Cent. and N. Asia; type species *O. glacialis*, mountains of Cent. Asia and Western China; genus ascends to 15000 ft. in Himalaya (*O. polypetala*), to 13000 ft. in Szechuan (*O. Delavayi*).
30. **Laccopetalum** *Ulbrich* in Engl. Bot. Jahrb. 37 : 404 (1906). 1 species, *L. giganteum*, Peru.
31. **Callianthemum** *C. A. Mey*.—9 species, S. Europe to N. E. Asia; type species *C. rutaefolium*, S.E. Eur.; genus ascends to 15000 ft. in Sikkim (*C. pimpinelloides*)——Revision by Witasek in Verh. Zool.—Bot. Gesellsch. Wien, 49 : 316–356 (1899).
32. **Ranunculus** *Linn.* (incl. *Beckwithia* Jephson and *Kumlienia* and *Halerpestes* Greene). —— about 300 species; Cosmopolitan; type species *R. auricomus*, widely spread in the N. Hemisphere. A complete revision of the species is a great desideratum.
33. **Adonis** *Linn*.——about 28 species, Temperate N. Hemisphere except America; type species *A. annua* (= *aestivalis* and *autumnalis*, fide Index Kewensis). Genus ascends to 11500 ft. in Yunnan (*A. brevistyla*).
34. **Knowltonia** *Salisb*.——10 species; extra-tropical S. Africa; type species *K. rigida*, Caledon to Uitenhage.——See Huth in Bull. Herb. Boiss. 5 : 423–5 (1896).
35. **Gampsoceras** *Stev*. in Bull. Soc. Mosc. 1852 : 542 t. vii. fig. 6. ——1 species, *G. Pinardi*, Asia Minor.
36. **Paroxygraphis** *W. W. Sm*. in Records Bot. Surv. Ind. 4 : 344 (1913).——1 species, *P. sikkimensis*, Sikkim, 12–14000 ft.
37. **Hamadryas** *Comm*.——5 species in extra-trop. S. America; type species *H. magellanica*, Magellan.——See Huth in Engl. Bot. Jahrb. 16 : 288–290 (1892).
38. **Trautvetteria** *Fisch et Mey*.——2 species, N. E. Asia to N. Amer.; type species *T. carolinensis*, Manchuria to N. America.——See Huth in Engl. Bot. Jahrb. 16 : 286–8 (1892).
39. **Thalictrum** *Linn*. (incl. *Piuttia* Mattei, *Stipularia* Delph. *Leucocoma* and *Sumnera* Nieuwl.).——about 100 species in both hemispheres except Australia, New Zealand, and extra tropical S. America; type species *T. foetidum*, S. Eur.; genus ascends to 15500 ft. in Thibet (*T. squamiferum*).—— Revision by Lecoyer in Bull. Soc. Bot. Belg. 24 : 78-325, pl. 1–4 (1885). East Asian spp. see Finet & Gagnep. Bull. Soc. Bot. Fr. 50 : 604–627 (1903).
40. **Kingdonia** *Balf. f. et W. W. Sm*. in Notes Roy. Bot. Gard. Edinb. 8 : 191 (1914).——1 species, *K. uniflora*, N. W. Yunnan, 13000 ft.
41. **Capethia** *Britton* in Ann. New York Acad. Sci. 6 : 216, 234 (1892).——2 species, W. S. Amer.; type species *C. integrifolia*, Peru to Ecuador.

Tribe V.—ANEMONEAE.

42. **Syndesmon** *Hoffmsegg.* (*Anemonella* Spach.)——1 species *S. thalictroides*, E. N. Amer.——Britton in Ann. New York Acad. Sci. 6 : 237 (1892).

43. **Anemone** *Linn.* (incl. *Pulsatilla** Linn. and *Aiolon* Lunell). ——about 180 species, Cosmopolitan; type species *A. coronaria*, Eur. to N. Asia. See E. Ulbrich, "Über die systematische Gliederung geographische Verbreitung der Gattung *Anemone* L." in Engl. Bot. Jahrb. 37 : 172–334 (1906) For East Asian spp. see Finet & Gagnep. in Bull. Soc. Bot. Fr. 51 : 56–76 (1904). See N. L. Britton, "The American species of the Genus *Anemone* and the Genera which have been referred to it", in Ann. N. York Acad. Sci. 6 : 215–238 (1892).

44. **Hepatica** *Dill.* ex *Linn.*——4 species, N. Temperate Zone; type species, *H. triloba*, Scandinavia to Pyrenees and across Asia to Canada.——For Amer. species see Britton in Ann. New York Acad. Sci. 6 : 233 (1892).

45. **Barneoudia** *Gay.*——4 species, Chili, Argentine; type species *B. chilensis*, Chili.——Britton in New York Acad. Sci. 6 : 235 (1892).

Tribe VI.—CLEMATIDEAE.

46. **Clematopsis** *Bojer* ex *Hutchinson* in Kew. Bull. 1920 : 12, figs. 1–5.——15 species, Trop. & S. Afr., Madag.; type species *C. pimpinellifolia*, Madag.

47. **Clematis** *Linn.*——230 species, mostly Temperate Regions, rare in Tropics; type species *C. Vitalba*, Europe.—— Revision by O. Kuntze, "Monogr. der Gattung Cl." 1885. See Boiss. Fl. Or. 1 : (1867). Hook. f. Fl. Brit. Ind. 1 : 2. For East Asian species see Finet & Gagnep. in Bull. Soc. Bot. Fr. 50 : 518–557 (1903). Cheeseman, Fl. New Zeal. 1 (1906). See also Gray, Synop. Fl. N. Amer. 1 : 4 (1895).

48. **Naravelia** *Linn.*——7 species, Indo-Malaya, South China; type *N. laurifolia*, Burma to Philippines.——Ridley, Fl. Mal. Penins. 1 : 2 (1922).

Doubtful genus—*Bodinieria* Léveille & Vaniot in Bull. Acad. Geogr. Bot. 1902, 48; not found in Léveille's herbarium, now at Edinburgh Botanic Garden.

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## VI.—NEOHOUZEAUA, A NEW GENUS OF BAMBOOS.

J. S. GAMBLE.

My attention was recently drawn by Mr. R. S. Hole, C.I.E., Forest Botanist at the Forest Research Institute at Dehra Dun, India, to a new genus of bamboo published by Mlle. A. Camus,

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* *See* p. 72.

in the Bulletin of the Musée National d'Histoire Naturelle, at Paris, for 1922, page 100, with the suggestion that a Burmese bamboo of which he was sending good and complete specimens and hitherto known as *Teinostachyum Helferi*, might belong to it.

The genus *Teinostachyum* was first established by Genl. William Munro, C.B., in his 'Monograph of the Bambusaceae.' Trans. Linn. Soc. Vol. xxvi (1868) to contain two species (1) *T. Griffithii* of Assam and Burma and (2) *T. attenuatum* of Ceylon, and a third was added later by Col. R. H. Beddome in his 'Flora Sylvatica' of S. India and Ceylon, viz.: *T. Wightii*, of the mountains of S. India. The chief characters of the genus were :—"Spikelets in bracteate whorls, long, many-flowered, glumes mucronate, palea convolute, stamens with free filaments, ovary long-beaked."

When writing the "Bambuseæ of British India,' Vol. vii, of the 'Annals of the Royal Botanic Garden, Calcutta,' I added to the other three two more which were imperfectly known. They were fairly well represented in Herbaria as regards leaves, etc., but good flower spikelets were not then available These two species were *T. Dullooa*, a widespread bamboo of the Eastern Himalaya, Assam, Chittagong and Burma, and *T. Helferi*, of the hills of Assam and Burma, originally described by Munro as *Bambusa Helferi* and transferred by Kurz to *Pseudostachyum*, a genus which I thought it very unlikely to belong to.

A few years ago, I received good specimens of *T. Dullooa*, collected at Mogaung, in Burma, by Mr. H. N. Thompson, Deputy Conservator of Forests, in March, 1896, and recognised that the structure of the flowers, with only one flower in each spikelet and monadelphous stamens, would not do for *Teinostachyum*, but I was too busy with other work to do more with the question either then or in 1921, when Mr. Hole sent me flowers from Sibsagar, in Assam, so I am glad to find that Mlle. A. Camus has taken the matter up and has described her own genus to contain two species, one from China, *N. Mekongensis*, and the other my *T. Dulloca*, whose range she extends to Tonkin, whence the Paris Herbarium had received specimens collected by Mons. Balansa. Indeed, it goes further than Tonkin, for I feel pretty sure that Dr. E. D. Merrill's No. 8246, collected in Mindanao, in the Philippines, leaf and sheath specimens only, is in all probability the same species.

Mlle. A. Camus' description of the genus *Neohouzeaua* is as follows :—

"*Panicula* elongata, ramosa, densa. *Spiculae* fertiles 1-florae; glumae steriles 3–4, mucronatae, saepe gemmiparae; gluma fertilis involuta, mucronata, subaristata; palea involuta, elongata, ecarinata, apice bicuspidata. *Glandulae* o vel parvulae. *Stamina* 6; filamenta connata; antherae apice obtusae. *Ovarium* oblongum; stylus rigidus, crassiusculus, elongatus; stigmata 3, exserta. *Fructus* . . ."

It seems to me that the only point in which this new genus differs from *Schizostachyum* as originally described is that the stamens are monadelphous instead of free.

As this character is considered sufficient to separate *Gigantochloa* from *Bambusa*, there is no reason why it should not be sufficient to separate *Neohouzeaua* from *Schizostachyum*, and perhaps some species described under the latter may also have to be transferred to the former. As a rough working key to the two genera and their neighbours, I suggest :—

Palea 2-keeled, two keels close together - *Cephalostachyum.*
Palea convolute, not keeled :—
Spikelets with several flowers - - - *Teinostachyum.*
Spikelets 1-flowered :—
Stamens monadelphous - - - *Neohouzeaua.*
Stamens free - - - - - *Schizostachyum.*

The description of the flowers of *N. Dullooa*, which may be added to those given in the 'Bambuseæ' at p. 101, and in the 'Flora of British India,' Vol. vii., p. 411, is as follows :—

"Spikelets usually 2 together, slender, bracteate at the base; empty glumes 2–4, small, mucronate; flowering glume oblong-lanceolate, mucronate, strigosely hirsute, 5–6 in. long, about 8–10 nerved; palea convolute, glabrous except near the apex, ·7–·8 in. long, biaristate, the base sometimes with a free terminal rachilla often bearing rudiments of a terminal flower; stamens 6, monadelphous, the anthers ·35 in. long, obtuse at apex, at length exsert; ovary elongate, glabrous, stigmas 3, short, red."

I now come to the question of *Teinostachyum Helferi*, of which Mr. Hole has sent me a number of excellent specimens in all stages. The spikelets are much larger than those of *N. Dullooa* and are 1–1·5 in. long, the palea is convolute with no trace of keels and biaristate, the stamens are monadelphous, so that it clearly must now be transferred to *Neohouzeaua* and be known as *N. Helferi* Gamble n. comb. The following description may be added to those given in the 'Bambuseae' and the 'Flora of British India.'

"Heads of spikelets often large, even up to 2 in. in diam., though usually less. Spikelets usually 2 together, slender, prominently bracteate at the base; empty glumes usually 2, small, ·2 and ·3 in. long, mucronate, the margins slightly strigosely hirsute; flowering glume ovate-lanceolate, long-mucronate, strigosely hirsute, ·5–1 in. long, many-nerved; palea convolute, glabrous except at the tip, 1·25–1·5 in. long, biaristate, the base sometimes with a free terminal rachilla; stamens 6, monadelphous, the anthers ·5–·75 in. long, obtuse at apex, at length exsert; ovary oblong, elongate, glabrous, stigmas 3, short, red; pericarp of caryopsis leathery, oblong, including the beak over 2 in. long.

The leaves, as shown by the fine specimens collected by Mr. K. F. R. Dickins and others in the Thandaung forests of the

Toungoo District, and sent by Mr. Hole, are very large, and may reach 24 in. in length and 5 in. in breadth, and end in a long and slender hispid acumination. Mr. Dickins' description is worth quoting. He says : "Wathabut is of evergreen caespitose type, tufted, semi-scandent, straggling and drooping, forming a thicket. Height 15–40 ft., more if the culms were erect. Internodal distance 18–24 in. and over (the specimens sent by Mr. Hole had the distance 32 inches, and two culms were 1–4 in. in diam.). Occurs at elevations of 3,000–4,000 ft. with a rainfall of over 200 in. a year. Appears to be flowering gregariously this year (1922). The culms are used for house-building and baskets, and owing to its thin walls, its pliability and the length between nodes is a useful species."

I now come to a third species, which I think belongs to the same genus, as it has the spikelets in pairs, 1-flowered, a convolute palea, biaristate at tip, and monadelphous stamens. It was collected in 1919 in Tavoy by Mr. C. Gilbert Rogers, C.I.E., then Chief Conservator of Forests in Burma, who describes it as "a small erect bamboo with culms from 10 to 15 ft. high, solid at base, about 2 in. in girth, and having the internodes of an average of 14–15 inches." It has the curious character of possessing on the lower side at the top of the leaf-sheath, a triangular horn-like appendage to the callus. I propose to call it *N. tavoyana*, and append a description of it.

**Neohouzeaua tavoyana** Gamble n. sp. Erectus, culmis 3–4·5 m. altis, circiter 1·5 cm. diametro, prope basim solidis. *Folia* oblonga, apice longe setaceo-acuminata, basi subobtusa, glabra, 25–35 cm. longa, 3–6 cm. lata, nervis primariis utrinque 6–10; petiolus crassus, planus, 1 cm. longus; vaginae glabrae teretes, sub petiolo productae et ad latus inferius callo triangulari cornuto munitae; ligulae productae, 3–4 mm. longae, apice lacerae. *Spiculae* binae in capitulis ad nodos paniculae terminalis aggregatae; capitulae inferiores sub-globosae, multispiculatae, 2–3 cm. diametro, superiores gradatim minores, ultimae 1–2 spiculas vel nullas gerentes; spiculae uniflorae, angustae, 2–2·5 cm. longae, basi bracteis multis suffultae et glumis vacuis mucronatis 2–3 ad basim munitae. *Gluma* florens ovato-oblonga, apice longiuscule aristata, dorso subglabra vel paullo hirsuta, 1–1·2 cm. longa, margine minute ciliato-scabra; palea angustissima multum convoluta, apice biaristata, 2–2·5 cm. longa. *Stamina* 6, monadelpha, antheris gracilibus, circiter 1 cm. longis, apice subobtusis. *Lodiculae* nullae vel 2 brevissimae. *Ovarium* longissimum, stigmatibus rubris. *Caryopsis* nondum visus.

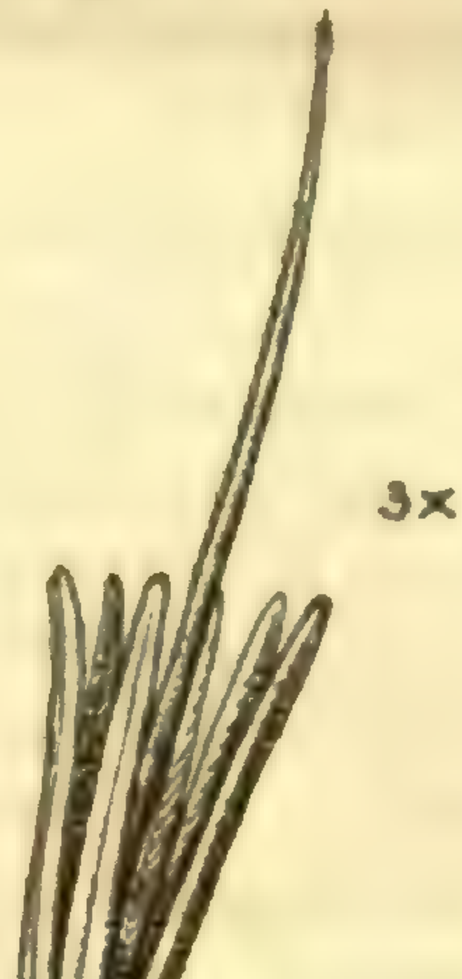
Burma. Sinyat hill in Tavoy at 300 m. alt. *C. G. Rogers*, Jan. 1919. No. 361 T.

In the size of the spikelet and, indeed, also, in the size of the leaves, this species is intermediate between. *N. Dullooa* and *N. Helferi*. It may be hoped that one of Mr. Rogers' successors will be able to ascertain more about it and send the culm-sheaths which have not yet been collected.

*Neohouzeaua tavoyana.*

*Neohouzeaua Helferi.*

*Neohouzeaua Dullooa.*



# VII.—MISCELLANEOUS NOTES.

Captain W. B. Dowson, B.Sc. (Agric.), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Superintendent, Agricultural Department, Nigeria.

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Mr. H. Nicholas, Dip. Agric., has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Superintendent, Agricultural Department, Gold Coast.

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Mr. F. S. Lyne, late Superintendent of the Accra Sisal Plantation, Gold Coast, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Director of Agriculture, Seychelles.

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Richard Arnold Dummer.—We regret to learn of the death, through a motor accident in Uganda, of R. A. Dummer, who was a student gardener at Kew from May, 1910, to June, 1911, having previously worked in the Municipal Gardens, Cape Town. After leaving Kew he assisted in the preparation of Elwes and Henry's "Trees of Great Britain," but at the same time was able to prepare several papers, which were published in the Journal of Botany. His "Enumeration of the Bruniaceae" formed Supplement II. to the volume for 1912, and in the same year he described *Pearsonia*, a new genus of *Leguminosae*, containing eleven species. He contributed notes on various South African plants to the Journal of Botany during 1913 and 1914 and the *Kew Bulletin* in 1912. In 1914 he obtained an appointment with the Kivuvu Rubber Company, Uganda, and, with the exception of a short stay in Cape Town, had resided in Uganda ever since. He made numerous collections, including many Fungi, in Uganda and Kenya Colony, and a letter from him announcing the despatch of further specimens arrived the day after the receipt of the news of his death.

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**Uses for Cedar Wood.**—Advice is often sought as to a market for the wood of the Lebanon cedar (*Cedrus Libani*), as after the fall of a large specimen the owner has great difficulty in disposing of it even at the price of firewood. The wood grown in this country is coarse in texture, but it is infinitely superior to coarse wood of silver fir, yet after a trunk or two have been purchased by a timber merchant they often lie on his hands for years without finding a purchaser. If, however, the owners of estates who have cedar wood for disposal would have it cut up into suitable sizes they would find it very useful for estate purposes. In some places it has been used for rafters, doors, mangers and racks in farm buildings with great success, whilst it has been found to make very good fencing, and excellent troughs and racks for the outdoor feeding of cattle, the wood being more durable than that of other kinds sometimes used for the purpose. The cleanest wood is very useful for linings of drawers and chests where

clothing is stored, the fragrance being a deterrent to insects. Furniture is sometimes manufactured from the wood, whilst it can also be used for panelling. Lack of a regular supply of the timber is probably the reason for the poor price realised, and with this and other woods that only appear upon the market as isolated examples the owner would often be well advised to have them cut up and worked for private purposes.—W.D.

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**Poplars for Farm Land.**—Although badly placed trees interfere a good deal with the proper use of agricultural land there are positions on most large farms where trees may be grown with advantage to the farmer either in the provision of shelter, shade for stock, or the cropping of land unsuitable for agriculture. In some places such land may be narrow copses or spinneys two or three acres in extent, in others there may only be space for a few trees, whilst elsewhere isolated trees may be needed along boundaries or water-courses. Wherever trees are needed, however, a species suitable for the position should be chosen and one that may be calculated to bring in revenue at some future date. Too often the trees planted in such places are mixed lots left in nurseries after the end of the planting season, whereas they should be as carefully chosen as trees for planting over extensive areas. Where land is moist but not waterlogged, poplars are satisfactory trees to plant. They are hardy, grow rapidly, and under ordinary conditions bring in a satisfactory return at the end of 50 years. They may even be induced to grow on waterlogged land by opening deep drains and planting cuttings or young trees on mounds two to three feet above the ordinary level. Moreover they are peculiarly suitable for small groups, narrow plantations and isolated trees near water, as they need to develop good heads of branches to insure satisfactory trunk increment. It is better to plant one kind than a mixture, and either one of the following may be chosen: *Populus serotina*, *P. Eugenii*, *P. trichocarpa*, *P. robusta*. *P. Eugenii* and *P. robusta* form much narrower heads than the other two, therefore they shade less of the surrounding land and are less liable to wind injury than the others. Cuttings one to three feet long may be inserted in the places the trees are to occupy, or cuttings a foot long may be raised in a garden and the young trees be planted out at the end of the first or second year. They must be protected from stock and vermin for a few years, the only other attention needed being the occasional removal of lower branches and keeping the trunks to a single leader.—W.D.

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**Index Kewensis**.—The task of compiling the quinquennial supplements of this work is steadily growing every year owing to the increasing amount of literature that has to be examined for the extraction of names. To add to the difficulties that have been encountered in recording synonymy generally, a practice has grown up of authors indicating after the specific name only

the name of the author who had originally used part of the combination, no reference being given to the work in which the original combination occurred, or indication that the combination was being used for the first time. In such cases the compiler of the Index has the very considerable task of searching the works of the original author until a name is found from which the new combination may have been derived. Thus the combination *Genus B species a* (Author A) Author B, will entail searching through the whole of Author A's works until an allied species with the trivial *species a* is found and even then there is nothing definite to show that *Genus A species a* Author A was the original.

It would be of the greatest assistance if authors would indicate the first time a new group or combination is used by adding the sign "n.sp." or "comb. nov.," and also cite the synonyms on which they are based.

The Index Kewensis is so greatly appreciated that it is felt that these difficulties need only be pointed out for all to assist in lightening the compiler's task.

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**Gold Coast Forest Officers' Handbook.***—In this useful handbook Major Chipp has brought together a mass of first-hand information on West African Forestry, especially on the forests of the Gold Coast, Ashanti, and the Northern Territories where the author was, until lately, Deputy Conservator of Forests.

Since Mr. H. N. Thompson made his preliminary survey of the Gold Coast in 1908, great progress has evidently been made in this important West African colony. In the attractive handbook before us we learn much about the natural features of the country, the climate and its relation to forest distribution, besides a history of the Forest Department. Lists of native and botanical names of trees and other plants of economic importance are given, and at the end of the book are reproduced the twenty drawings of the more useful trees which appeared in Mr. Thompson's report. Especially useful to even casual visitors to the colony will be the notes on the every-day life of the West Coast, and the outfit required by the European. The book is well printed and illustrated by several maps and diagrams.—J.H.

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**Chinese Botany.**—Two papers on Chinese botany appeared last year in the Journal of the North China branch of the Royal Asiatic Society. The first (vol. liii., 158–188) is a list of the plants of Peitaiko by Mr. N. H. Cowdry, the second a "Liste des Essences ligneuses observées dans le Honan Septentrional," by Mr. J. Hers. Both give the Chinese equivalents of the species mentioned. We are glad to welcome these and other signs of botanical activity among foreign and native residents in China.—S.T.D.

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* T. F. Chipp, The Forest Officers' Handbook of the Gold Coast, Ashanti and the Northern Territories, pp. 149, tt. i.–xx., with maps and diagrams. Published for the Government of the Gold Coast by the Crown Agents for the Colonies, 4, Millbank, London, S.W. 1.

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PLATE I.

PRIMULA CALCIPHILA.

*To face page* 97]

*x* 19647

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

No. 3] [1923

## VIII.—PRIMULA CALCIPHILA.

THE SO-CALLED WILD FORM OF **Primula Sinensis**.

J. HUTCHINSON.

Since the year 1820, when it was first introduced into cultivation, *Primula sinensis* has been one of the most valuable and popular of our winter-flowering greenhouse plants. The species was first made known to botanists and horticulturists in this country through a drawing made in China in 1819 under the auspices of one John Reeves, an active member of the Horticultural Society in those days. This drawing so attracted the attention of the members of the Society that efforts were at once made to obtain living specimens. These were procured in 1820 by a Captain Rawes who presented them to his friend Thomas Palmer, of Bromley, Kent. Subsequently two coloured drawings were prepared from Mr. Palmer's plant, one being published by Lindley in his Collecta Botanica, tab. 7 (1821) as *P. sinensis*, and the other by Ker in the Botanical Register 1821, tab. 539 as *P. praenitens*.

In his description in the Botanical Register, Ker states that Rawes obtained his plant "from the gardens at Canton, where it probably found its way from some far more northern quarter of the Chinese Empire; none of this generic type having, we believe, been observed as natives of the levels of so low a latitude. Samples in a dried state had been previously transmitted by Mr. Reeves, a gentleman in the employment of the East India Company at Canton."

*P. sinensis* was quickly distributed in gardens, for in 1825 a coloured picture was published in the Botanical Magazine (t. 2564), and it was noted therein that in March of that year there was already a large collection of the species at the Horticultural Society's gardens at Chiswick. In 1824 it was in the possession of Mr. Joseph Knight, the well-known Chelsea nurseryman. The plant figured in the Botanical Magazine

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already showed reversion to the 5-parted calyx type, as distinguished from the 10-parted calyx type, a character specially remarked upon and figured by Lindley.

The name *P. praenitens* was evidently published a few months before *P. sinensis*, for Ker gives as a reason for not using *P. sinensis* the fact that the name had already been used by Loureiro in the Flora Cochinchinensis for another Chinese plant which might or might not belong to the genus *Primula*. It is to be regretted that the International Congress of Botanists at Vienna in 1905 did not consider the needs of horticulturists when formulating their rules and recommendations of botanical nomenclature. If they had done so they would surely have drawn up a list of *nomina conservanda* for well-known and generally accepted specific names of garden plants, amongst which would certainly have been included that of *Primula sinensis*. Who now wants to call this plant *P. praenitens* Ker, because the latter name was published a few months earlier, or because the name *P. sinensis* had already been used by Loureiro for another Chinese species, which has remained in obscurity ever since? Even Pax, the monographer of the genus in Engler's Pflanzenreich, has in this instance waived the rule of priority in favour of the generally accepted name, and it is to be hoped that all botanists will continue to follow him.

The task of following the fortunes of *P. sinensis* and its multitude of forms from its introduction to the present day is not within the scope of the present paper. For further information the reader is referred to Mr. A. W. Sutton's comprehensive paper on the subject in the Journal of the Royal Horticultural Society, n. ser. 13 : 99–114 (1891). During the hundred years of its cultivation it has remained one of the chief ornaments of our greenhouses during the winter months, and in order fully to appreciate the great range of variability of this remarkable species a visit should be paid to the John Innes Horticultural Institution at Merton, where Dr. W. Bateson, F.R.S., has a large greenhouse entirely devoted to the species.

Our chief concern is rather with the so-called wild form of *Primula sinensis*. Apparently Hance was responsible for first considering an Ichang plant to be the wild form of *P. sinensis* ; the specimen he determined was collected by T. Watters in 1879, and the identification appeared in Hance's paper entitled " Diagnoses of New and Habitats of Rare or Hitherto Unrecorded Chinese Plants " in the Journ. of Bot. 1880 : 262. A few years later Franchet made a similar and apparently independent determination of a plant collected near Ichang by Delavay, for we have in the Kew Herbarium a wild specimen definitely named *P. sinensis* Lindl., collected by Delavay (No. 316) on 11th of March 1882, and communicated to Kew in April 1886. The first specimen received from Prof. A. Henry arrived at Kew in March 1886, but being fragmentary it was evidently not determined until several years later when Dr. Hemsley revised the

species of *Primula* for the Index Flore Sinensis. Much better material was received from Henry in September 1886 and compared by Professor D. Oliver with Delavay's collection. In 1897, when a drawing of the plant appeared in the Botanical Magazine, this determination was evidently never questioned by Sir Joseph Hooker who supplied the description. According to Hooker the plant figured there was one of a batch of seedlings grown by Lady Hutt, of Appleby Towers, Ryde, and raised from seed sent by Mr. Pratt from Ichang. Dr. Masters obtained some of these plants and passed them on to his friend Mr. Edmund Hyde, of Ealing, who was the first to flower this wild form in 1892.

During the last few years it has become manifest to several people that there must have been some error in the assumption that the Ichang plant was the wild form of *P. sinensis*. According to Dr. Bateson (see Gard. Chron. Ser. III. 55. 131 (1914) ) all efforts to cross the Ichang plant with cultivated *P. sinensis* have failed, and he considers it impossible that it had anything to do with that species.

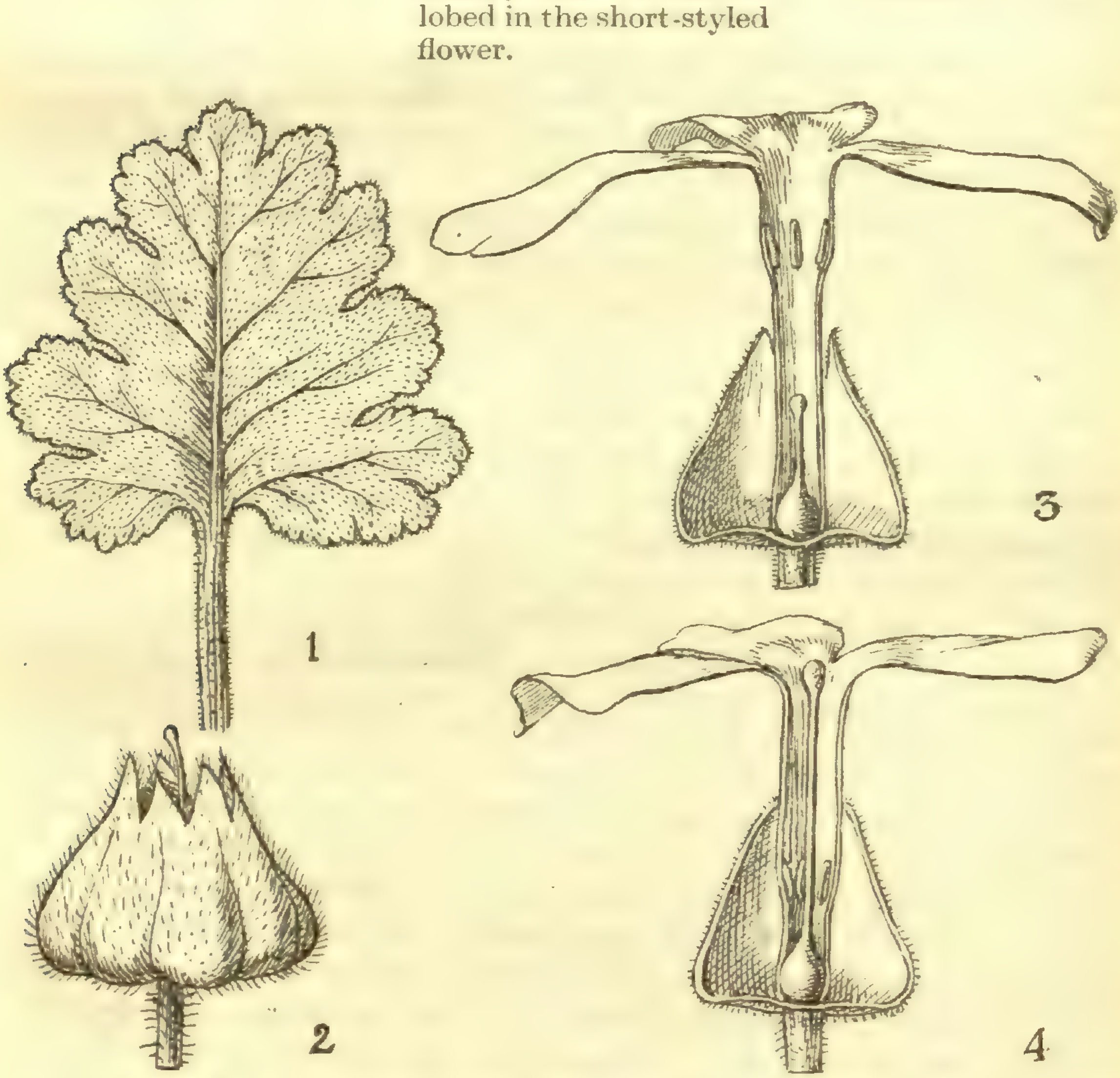
Collectors in China have subconsciously contributed remarks which greatly strengthen the view that the Ichang plant is something different from the cultivated *P. sinensis*. Thus Mr. E. H. Wilson writes (Gard. Chron. Ser. III. 40 : 206 (1906) ) :—" I may perhaps remind readers that in a wild state this plant (the Ichang plant) is a true perennial, and occurs on bare ledges and niches of cliffs fully exposed to the sun where it gets but very little moisture. In a state of nature the flowers are of a uniform mauve-pink, and I never saw any variation in colour, not even an albino. This is, to say the least, remarkable, when we consider the wide range of colour we find in this plant under cultivation. In late January and February the cliffs around Ichang, where this plant has its home, are a delightful picture. After flowering the flower-stalk becomes negatively heliotropic, an interesting biological character which the plant appears to have lost under long cultivation." Other limestone-loving species in China mentioned by Wilson are *P. yunnanensis*, *P. pulchella*, and *P. bracteata*. In the Gard. Chron. Ser. III. 37 : 332 (1905) he also remarks on the great divergence of the florist's flower from the type as found growing near Ichang, and says that " the only thing that has remained constant is the perfume " !

The present writer is not entitled to credit for raising any of these doubts as to the authenticity of the wild form. His part has been merely to consider the evidence now available and to re-examine the specimens from the taxonomic standpoint. This he has done at the instigation of the Director of the Royal Botanic Gardens, Kew, who had himself prepared notes on the subject which have been kindly placed at his disposal. Thanks are also due to Dr. Bateson for similar facilities.

The differences between the two species in question and the closely allied *P. rupestris* are set out below, together with a

description of the Ichang plant, for which the name *P. calciphila* is proposed, in reference to its lime-loving character.

| *P. sinensis* Lindl. | *P. calciphila* Hutchinson. | *P. rupestris* Balf. f. et Farrer. |
|---|---|---|
| *Habitat :* not known. | *Habitat :* limestone cliffs of Ichang, Hupeh, China. | *Habitat* limestone cliffs of Szechuan, China. |
| *Petioles :* fleshy and rotting with age. | *Petioles :* becoming dry and persistent and forming a dense covering on the old stems. | *Petioles :* as in *P. calciphila.* |
| *Calyx :* much inflated (see text figure 2), often irregularly 10-toothed. | *Calyx :* triangular in outline, truncate at the base shortly 5-lobed, the lobes shorter than the calyx-tube and broadly triangular. | *Calyx :* more or less as in *P. calciphila,* but divided beyond the middle into 5 elongated more or less lanceolate lobes. |
| *Corolla* very variable. | *Corolla :* lobes often entire in the long-styled flower, usually more or less bilobed in the short-styled flower. | *Corolla :* lobes rather widely and deeply bilobed. |




1. Leaf of *Primula calciphila* Hutchinson × ⅔; 2, typical calyx of *P. sinensis* × 1½; 3, longitudinal section of short-styled, 4, of long-styled flowers of *P. calciphila* × 2.

In a large batch of cultivated plants of *P. calciphila* (see photograph) very little variation is observable. The leaves are

remarkably uniform in shape and indumentum. The colour of the flower varies very slightly from pale lilac to rose-lilac, the "eye" being a very pale greenish yellow. There is usually a remarkable difference in the corolla-lobes, however, which may be either 4 or usually 5-lobed; in the long-styled form the corolla lobes (*see* text figure 4) are often entire or almost entire at the apex, whilst in the short-styled form they are mostly conspicuously bilobed as shown in the photographic illustration. Very rarely one or two of the corolla lobes have an additional lobe on the inside near the base. *P. calciphila* will probably prove to be a valuable decorative plant during the winter months. It gained the Award of Merit at the Royal Horticultural Society's Show on Feb. 13th 1923. The following is a description of the new species :—

**Primula calciphila** *Hutchinson*, new species.

*Primula sinensis* Hance in Journ. Bot. 1880 : 262; Franch. in Bull. Soc. Bot. Fr. 33 : 65 (1886); Hemsl. and Forbes in Journ. Linn. Soc. 26 : 42 (1889); Hook. f. Bot. Mag. t. 7559 (1899); A. Henry in Gard. Chron. Ser. III. 31 : 269, fig. 84, 85 (1902). Pax in Engl. Pflanzenr. Primul. 21 partly (1905); E. H. Wilson in Gard. Chron. Ser. III. 40 : 191, fig. 78 (1906).—non Sabine ex Lindl.

Herba perennis pilis brevibus albidis glandulosis ubique induta; caulis brevissimus, ramosus, basin versus petiolarum basibus persistentibus membranaceis imbricatim obtectus. Folia numerosa, radicalia, late ovato-rotundata, basi truncata vel late subcordata, apice rotundata, 3–5 cm. longa, 3–4 cm. lata, pinnatim 6–7-lobata, lobis oblongis vel rotundatis crasse et inaequaliter crenato-dentatis, utrinque breviter et molliter glanduloso-pubescentia; nervi laterales utrinsecus 3–4, supra leviter impressi, infra lati et prominentes, marginem versus furcati; petioli erecto-patentes, saepe circiter 10 cm. longi, basi supra complanati et canaliculati, longe ciliati, infra convexi et nitidi, superne subteretes et breviter glanduloso-pubescentes, circiter 2 mm. crassi. Inflorescentia umbellata, usque ad 14-flora, saepe circiter 6–8-flora; pedunculi erecti, usque ad 15 cm. longi, circiter 3 mm. crassi, glanduloso-pubescentes; bracteae lineares vel lineari-lanceolatae, subacutae, circiter 1 cm. longae, virides, basin versus carinatae, glanduloso-ciliatae et breviter glanduloso-pubescentes; pedicelli inaequales, usque ad 4 cm. longi, pilis patulis glandulosis pubescentes. Calyx ambitu triangularis, basi truncatus, circiter 1 cm. longus et latus, viridis, pilis glandulosis pubescens; lobi tubo breviores, triangulari-lanceolati, subacuti, 3–4 mm. longi Corolla pallide lilacina vel roseo-lilacina, calyce duplo longior; tubus cylindricus, in forma brevistyla per tertiam partem summam in forma longistyla per tertias duas partes superiores dilatatus, apicem versus parce glandulosus; lobi 5 vel interdum 4, in forma longistyla interdum integri, in forma brevistyla bilobati, obovati, circiter 1·5 cm. longi et 1 cm. lati, supra basin versus pilis

glandulosis ornati. Stamina in forma brevistyla circiter 4 mm., in forma longistyla circiter 9 mm. infra apicem corollae tubi inserta; antherae fere sessiles, pallide flavae 3 mm. longae. Ovarium globosum, viride, glabrum; stylus pallidus, nunc circiter 3·5 mm. longus et stigmate globoso, nunc 1 cm. longus et stigmate obovoideo.

A perennial herb coated everywhere with short whitish gland-tipped hairs; stem very short, branched, when old closely invested by the persistent membranous bases of the petioles. Leaves numerous, radical, broadly ovate-rounded, truncate or widely subcordate at the base, rounded at the apex, 3–5cm. long, 3–4cm. broad, pinnately 6–7-lobate, the lobes oblong or rounded, rather coarsely and unequally crenate-dentate, shortly and softly pubescent on both surfaces with gland-tipped hairs; lateral nerves 3–4 on each side of the midrib, slightly impressed above, broad and prominent below, forked towards the margin; petiole erect-patent, usually about 10cm. long, flattened and grooved above towards the base and long-ciliate, convex below and shining, subterete and shortly glandular-pubescent upwards, about 2mm. thick. Inflorescence a simple umbel, up to about 14-flowered, usually about 6–8-flowered; peduncle erect, up to about 15cm. long, about 3mm. thick, glandular-pubescent; bracts as many as the flowers, linear or linear-lanceolate, subacute, about 1cm. long, green, keeled towards the base, glandular-ciliate and shortly glandular-pubescent; pedicels rather unequal, up to 4cm. long, pubescent with horizontally spreading gland-tipped hairs. Calyx triangular in outline, truncate at the base, about 1cm. long and broad, green, softly pubescent with gland-tipped hairs; lobes shorter than the tube, triangular-lanceolate, subacute, 3–4mm. long. Corolla pale lilac or rose-lilac; tube about twice as long as the calyx, cylindric, slightly wider in the upper third in the short-styled form, in the upper two-thirds in the long-styled form, sparingly glandular towards the top; lobes 5 or sometimes 4, often entire in the long-styled, usually bilobed in the short-styled flower, obovate, about 1·5cm. long and 1cm. broad, with a few shortly stalked glands towards the pale greenish yellow base. Stamens in the short-styled flower inserted about 4mm., in the long-styled flower about 9mm. below the apex of the corolla-tube. Anthers almost sessile, pale yellow, 3mm. long. Ovary globose, green, glabrous; style pale, about 3·5mm. long in the short form and with a globose stigma, about as long as the tube in the longer form, with an obovoid stigma.

Described from a batch of cultivated plants grown in the Royal Botanic Gardens, Kew—Type indicated in Herb. Kew; the following wild specimens belong to this species :—

China. Hupeh : Shady places near Ichang, Jan. 1879, *T. Watters*; dry limestone cliffs near Ichang, 11th March, 1882, *Delavay* 316 ! *A. Henry* 879 ! 1103 ! 1292 ! Feb. 1900, *E. H. Wilson* 161 ! Mar. (fl.) and June (fr.) 1907, *E. H. Wilson* 67 !

# IX.—CONTRIBUTIONS TO THE FLORA OF SINALOA: I.

L. A. M. Riley.

The State of Sinaloa is situated on the Pacific littoral of Northern Mexico, and is bounded on the north by Sonora and Chihuahua, on the east by Durango and on the south by Tepic, the Gulf of California forming its western limit. The greater part of Sinaloa lies north of the Tropic of Cancer. Its area is 33,671 sq. m., and the population in 1910 was estimated at 323,642 persons, of whom a large proportion consisted of Indians. Three climatic zones may be distinguished: "a narrow coastal zone where tropical conditions prevail, a broad belt of mountainous country covered by the ranges of the Sierra Madre Occidental and their intervening valleys where oak and pine forests are to be found, and an intervening zone among the foothills of the Sierra Madre up to an elevation of 2,000 ft., where the conditions are subtropical."*

There are two distinct seasons in most parts of Mexico, the dry (October to May) and the rainy (June to September). The warmest month is generally July, and the coolest December or January. The following data for the seaport of Mazatlan give some idea of the climate of the southern part of the coastal zone: total annual rainfall, 32 in.; mean monthly temperature of coolest month (January), 67° F., of warmest month (July), 82° F.† More detailed meteorological data for Mazatlan are given by Harshberger.‡ Rain is plentiful everywhere in Sinaloa except in the extreme north, where the conditions are arid.§

Phytogeographically speaking, the north of the coastal zone is included in the Sinaloa district of the Sonoran Desert Region, while the remainder of the coastal zone falls within the Jaliscan Region. The tract of mountainous country in the interior belongs, on the other hand, to the Western Sierra Madre Region.‖

Our knowledge of the flora of Sinaloa may be said to commence with the publication of Seemann's Flora of North-Western Mexico (Bot. Herald, 257–346; 1856). The "Herald" anchored in the port of Mazatlan on Nov. 26, 1848, and remained there until Dec. 4. Seemann left the port without delay for San Sebastian, a small town about 1,000 ft. above sea-level, and on the following day proceeded to the Hacienda de las Naranjas, a farm on the foot of the Cerro de Pinal, where he "stayed two days, and found in the neighbourhood a fine mountain vegetation—pines and oaks in the greatest profusion." He returned by the same route, passing the villages of Santa Catarina and Nanches, and the town of San Sebastian and El Presidio de Mazatlan.

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* Encycl. Brit., ed. 11, xxv. 140 (1911).
† Admiralty Intelligence Division, Handbook of Mexico, 35–38 (1919).
‡ Phytogeogr. Surv. N. Am., 150, 151 (1911).
§ Encycl. Brit., ed. 11, 140.
‖ Harshberger, l.c. 636, 640, 657.

Seemann's second journey in Sinaloa was more extended. On Nov. 23, 1849, he left Mazatlan for San Sebastian, where he remained one day, and then proceeded towards Durango, reaching the village of Copala on Nov. 26 and Santa Lucia on Nov. 27. The latter village was one of the most charmingly situated places he had seen in Mexico, and he appears to have made extensive collections in the neighbourhood. "Situated about 4,000 feet above the sea, enjoying throughout the year a temperate climate, it lies in a romantic valley, encircled by wooded mountains, which admit a view of the Pacific Ocean. The houses of the Indians, scattered over an undulated surface, are surrounded by a vegetation in which the graceful forms of the tropics are harmoniously blended with those of the temperate zone. *Mimosae* stand in company with oaks and firs [pines], hardy *Umbelliferae* and *Compositae* with Cupheas, Lobelias and Lophospermums; nearly every hedge is overgrown by a splendid *Ipomoea*, the azure blossoms of which are from four to five inches across, and set so close together that hardly a leaf is to be seen, and the whole plant resembles a blue sheet, whence it derives its vernacular name, 'Manto de la Virgen' (Cloak of the Holy Virgin)."

Leaving Santa Lucia he passed Ocotes, a place deriving its name from the 'Ocote,' a pine from which pitch is made. The boundary of the State of Durango is about four miles beyond Ocotes, and the remainder of Seemann's journey to the city of Durango does not concern us. The return journey from Durango to Mazatlan (Feb. 13–22, 1850) was made under difficulties, and it is improbable that Seemann was able to do any collecting. "The road was in a terrible state, for the wild Comanche Indians having come near and killed several of the rancheros, most of the places were deserted, the people having fled."

In more recent years Sinaloa has been visited by various botanists including Palmer, Rose, and Brandegee. The last-mentioned published a list of the more interesting plants collected by him containing "in addition to descriptions of new species, only names of those plants whose distribution seems worthy of note."*

The present enumeration of Sinaloa plants has been based on (1) a collection of dried plants received from Señor J. Gonzalez Ortega; (2) the records in Seemann's Botany of the 'Herald,' and Hemsley's Biologia Centrali-Americana, Botany; (3) Brandegee's list, mentioned above; (4) numerous scattered records published in the Contributions from the United States National Herbarium, the Proceedings of the American Academy of Arts and Sciences, and elsewhere. Many species have also been included on the strength of the geographical distribution indicated in Standley's "Trees and Shrubs of Mexico."†

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* Zoe, v. 196 (1905); et l.c. 241 (1906).

† Contrib. U.S. Nat. Herb., xxiii, part 1 (1920); part 2 (1922).

With regard to Seemann's records, it should be pointed out that many of his specimens were labelled and cited by him merely as "Sierra Madre." These have been provisionally included in the Sinaloa list, as there was no means of distinguishing those collected within the boundaries of Durango and Tepic. Such records require confirmation. The town of Agiabampo, visited by Palmer in 1890, lies actually within the boundary of Sonora. On account, however, of its proximity to Sinaloa, and also in view of the fact that the greater part of the Estero de Agiabampo lies in Sinaloa, it has seemed desirable to include records from this vicinity.

In order to economize space, the following abbreviations have been adopted: CNH., Contrib. U.S., Nat. Herb.; PAA., Proc. Am. Acad.; SBH., Seem. Bot. Herald.

I desire to acknowledge my indebtedness to Mr. T. A. Sprague, who has continuously placed his knowledge and advice at my disposal.

## Ranunculaceae.

**Clematis dioica** *L.*; SBH. 267; CNH. xxiii. 267.
Between Mazatlan and San Sebastian, *Seemann*. [I have been unable to find Seemann's specimen.]

**C. Drummondii** *Torr. et Gray*; CNH. xxiii. 267.

**C. Pitcheri** *Torr. et Gray*; CNH. xxiii. 266.
Vernacular name "Barba de viejo."

## Dilleniaceae.

[**Curatella americana** *L.*
Tepic: Acaponeta, *Gonzalez* 1121. Vernacular name "Rasca la Vieja." Widely distributed in tropical America, but not hitherto recorded from Sinaloa.]

## Magnoliaceae.

**Magnolia Schiedeana** *Schlecht.*; CNH. xxiii. 275.

## Anonaceae.

**Anona Cherimolia** *Mill.*; Kew Bull., Aug. 1887, 15; CNH. v. 215.
"A very abundant fruit in the markets of Mexico."
Vernacular name "Chirimoya."

**Sapranthus foetidus** (*Rose*) *Safford*; CNH. xxiii. 278.—*Asimina foetida* Rose.
Vernacular name "Zopilotillo."

**Sapranthus** sp. nov.
San Ignacio: La Caña, 450 m. *Gonzalez* 856. Vernacular name "Zopilotillo." Allied to *S. nicaraguensis* Seem., from which it differs in the much smaller flowers and leaves. Material insufficient for description.

### Menispermaceae.

[**Cocculus diversifolius** *DC.*
Widely distributed in Mexico as far southwards as the isthmus of Tehuantepec, and probably occurs in Sinaloa.]

**Cissampelos Pareira** *L.*, var. **typica** *Diels* in Engl. Pflanzenr. Menisperm. 288.
San Ignacio: Yxtagua, 370 m., *Gonzalez* 753.

### Nymphaeaceae.

**Nymphaea elegans** *Hook.*; Conard, Waterlilies, 131.—*Castalia elegans* Greene; CNH. x. 94.
Topolobampo, *Palmer*; Mazatlan, *Brandegee*; near Rosario, *Rose*.

### Papaveraceae.

**Argemone mexicana** *L.*; SBH. 268.
San Ignacio: Rancho de los de Ponce, 260 m. *Gonzalez* 133. Common in the lower coast region, according to Seemann. Vernacular names: "Chicalote," "Cardo."

**Bocconia arborea** *S. Wats.*; Hutchinson in Kew Bull. 1920, 277; CNH. xxiii. 300.
San Ignacio: Yxtagua, 500 m. *Gonzalez* 369. Vernacular names: "Palmilla," "Palo del diablo."

### Cruciferae.

**Lepidium virginicum** *L.*, subsp. **centrali-americanum** *Thell.* Monogr. 231 (1906).
San Ignacio: Arroyo de la Labor, 380 m., *Gonzalez* 310.

### Capparidaceae.

**Cleome melanosperma** *S. Wats.*
Rosario, *Rose* 1841.

**Cleome sinaloensis** *Brandegee* in Zoe, v. 198 (1905).
Culiacan, *Brandegee.*

**Morisonia americana** *L.*; CNH. xxiii. 302.
Vernacular name "Chico."

**Forchammeria Watsoni** *Rose*; CNH. xxiii. 306.

**Capparis flexuosa** *L.*; CNH. xxiii. 303.

**C. indica** (*L.*) *Fawcett et Rendle*; CNH. xxiii. 304.—*C. Breynia* L. *C. amygdalifolia* Jacq.

**C. verrucosa** *Jacq.*; Sel. Stirp. Am. Hist. 159, t. 99; Eichl. in Mart. Fl. Bras. xiii. pars 1, 285, t. 63, fig. 2; CNH. xxiii. 303.—*Capparis Palmeri* Rose.
Mazatlan, *Coulter* 669.

**Crataeva Palmeri** *Rose*; CNH. xx. 183.
Fuerte, Guadalupe, Culiacan and San Blas, *Rose, Standley & Russell* 13482, 14676, 14846, 13210.

**C. Tapia** *L.*; SBH. 268.
Mazatlan, *Seemann*.
[The genus *Atamisquea* Miers should be looked for in Sinaloa, where it may be expected to occur on account of its known distribution.]

CISTACEAE.

**Halimium concolor** *Riley*, sp. nov.; affine *H. Coulteri* S. Wats., foliis concoloribus, indumento foliorum nunquam tomentoso et inflorescentia compactiore differt.
*Fruticulus* erectus, ramosus, caulibus pilis fulvis stellato-pubescentibus, superne stellato-tomentellis. *Folia* breviter petiolata, elliptica, acuta vel obtusiuscula, basi attenuata, 1·5–2 cm. longa, 4–6 mm. lata, concoloria, utrinque pilis discretis stellato-pubescentia, subtus fasciculis densioribus, nunquam tomentosa, costa tantum valde prominente. *Inflorescentia* capitato-congesta, multiflora. *Sepala* sub fructu lanceolata, acuminata, circiter 6 mm. longa, longe albo-hirsuta. *Petala* non visa. *Capsula* glabra, sepala vix superans, valvis anguste ovatis, apice obtusis vel emarginatis.
SINALOA: San Ignacio; Cerro del Buen Retiro, 1660 m., *Gonzalez* 842 (type in Herb. Kew.).

[**H. glomeratum** (*Lag.*) *Gross.* has been recorded from Tepic and Durango, but there are no specimens from Sinaloa in the Kew Herbarium or British Museum.]

VIOLACEAE.

**Viola Grahami** *Benth.* Pl. Hartweg. 35; Hemsl. Biol. i. 50.
Sierra Madre, *Seemann*.

**Viola pteropoda** *Hemsl.*; Biol. i. 51.—*V. Hookeriana* Seem. Bot. Herald, 269 (1856), non H. B. K.
Sierra Madre, *Seemann* 2144.

**Ionidium lasiocarpum** *Presl.*; Zoe, v. 213.
Culiacan and Cofradia, *Brandegee*.

BIXACEAE.

**Cochlospermum vitifolium** *Willd.*—*C. hibiscoides* Kunth.; Hemsl. Biol. i. t. 2. *Maximiliania vitifolia* Krug. et Urb.; Blake in Journ. Wash. Acad. Sc. xi. 128 (1921).
San Ignacio: Agua Colgada, 405 m., *Gonzalez* 774.
Vernacular name "Rosa amarilla." The orange inner bark is used in Sinaloa for making ropes. The branches root readily if thrust into the ground, and are frequently used to form hedges.

**Amoreuxia Gonzalezii** *Sprague et Riley* in Kew Bull. 1922, 102, t. 1, fig. 1.
Choix: Cerro del Muerto, 620 m. *Gonzalez* 897 (type in Herb. Kew.). Vernacular name "Zaya."

**A. palmatifida** *Moc. et Sessé ex DC.*; Zoe, v. 213; Sprague in Kew Bull. 1922, 104, t. 1. fig. 5.

Between Rosario and Colomas, *Rose* 1624; Culiacan, *Brandegee*. Rose's specimen differs from typical *A. palmatifida* in the less deeply divided leaves, which have broader segments with a shorter basal portion. The serration is coarser, and the mesophyll is conspicuously marked on the lower surface with irregular dots and dashes due to the presence of resin. I have not seen Brandegee's specimen.

**Bixa Orellana** *L.*; SBH. 268; Kew Bull. July, 1887, 1–8; Sept. 1887, 1–4.

Common in the coast region, from Mazatlan southwards, according to Seemann. Vernacular name "Achiote."

## Polygalaceae. F 145

**Polygala Albowiana** *Chod.* in Bull. Herb. Boiss. iii. 123 (1895); Zoe, v. 204.

Cerro Colorado, Cofradia, *Brandegee*.

**Polygala alba** *Nutt.* var. **tenuifolia** *Blake* in Contr. Gray Herb. n.s. xlvii. 86 (1916).—*P. bicolor* H. B. K.; SBH. 269.

Sierra Madre, *Seemann* (Gray Herb.).

**P. alba** *Nutt.* var. **suspecta** *S. Wats.*; Blake l.c.—*P. bicolor* H. B. K.; SBH. 269. *P. verticillata* Hemsl. Biol. i. 62 (1879), non Linn.

Sierra Madre, *Seemann* 2153 (Brit. Mus.).

**P. collina** *Brandegee* in Zoe, v. 204 (1905).

Cerro Colorado, *Brandegee*.

**P. crinita** *Chod.*; Blake l.c. 89.—*P. setifera* Brandegee in Zoe, v. 205.

Cerro Colorado, *Brandegee*.

**P. glochidiata** *H. B. K.*; Zoe, v. 204; Blake l.c. 91.—*P. paniculata* Seem. Bot. Herald, 269 (1856), non Linn.

Cerro de Pinal, *Seemann*, 1519 partim (Herb. Kew.); Cerro Colorado, *Brandegee*.

**P. gracillima** *S. Wats.*; Blake l.c. 97.

Cerro de Pinal, *Seemann* 1519 partim (Herb. Kew.).

**Polygala sinaloensis** *Riley*, sp. nov.; affinis *P. appressipili* Blake, foliis majoribus lanceolatis membranaceis utrinque viridibus, pedicellis gracilioribus, floribus minoribus, alis apice obtusis nec rotundatis differt.

*Suffruticulus*, ut videtur, caulibus simplicibus, ad 3·6 dm. altis, pilis incurvis appressis obtectis. *Folia* breviter petiolata, lanceolata, acuta, minute cuspidato-apiculata, basi inaequaliter acuta, 3·5–5·2 cm. longa, 1–1·7 cm. lata, membranacea, utrinque viridia, sparse puberula pilis incurvo-appressis, nervis 2–3 jugis; petiolus 2 mm. longus. *Racemi* laxiflori, ad 13 cm. longi. *Pedicelli* 3 mm.

longi, gracillimi, appresso-puberuli. *Flores*, ut videtur, ochroleuci. *Sepala* ciliata, extra pilis grossiusculis incurvo-appressis induta, anteriora oblique ovato-lanceolata, 3 mm. longa, 1 mm. lata, posterius ovato-lanceolatum, 4 mm. longum, 2 mm. latum. *Alae* ellipticae, apice obtusae, basi cuneatae, vix ciliatae, venis haud prominentibus, epunctatae. *Carina* glabra, 7 mm. longa, 1·5 mm. lata. *Petala superiora* oblonga, obtusa, utrinque glabra, vix ciliata, 5 mm. longa, 1·5 mm. lata. *Capsula* suborbicularis, juventute 7–8 mm. longa, 6 mm. lata. marginibus ciliatis exceptis glabra.

SINALOA: San Ignacio; Arroyo del Coacoyol, 400 m. *Gonzalez* 588 (type in Herb. Kew.).

I find the measurements given by S. F. Blake in his Revision of the Genus *Polygala* (Contr. Gray Herb. xlvii. 41) for the flowers of *P. appressipilis* are smaller than those which I found on measuring a moistened flower of that species. My measurements are:—anterior sepals 4 mm. long; posterior sepal 5 mm. long; carina 8 mm. long. My measurements for *P. sinaloensis* are from the moistened flower.

**Monnina xalapensis** *Kunth.;* SBH. 270; Hemsl. Biol. i. 63.
Sierra Madre, N.W. Mexico, *Seemann* 2154.

**Krameria bicolor** *S. Wats.;* CNH. xxiii. 348.

Choix: El Rincon, 700 m. *Gonzalez* 889. Vernacular name "Guachapurillo." This may be a variety. It differs, in comparison with the type number, in being less densely hairy in all its parts, in having longer and slenderer branches, sparser foliage and, on the whole, narrower leaves. The spines of the fruit are slender, whereas Watson has described those of *K. bicolor* as being "rather stout." I have not seen fruits of the type number.

**K. Palmeri** *Rose* in CNH. i. 304 (1895); CNH. xxiii. 347.
Agiabampo, *Palmer* 753.

**K. prostrata** *Brandegee* in Zoe, v. 200 (1905); CNH. xxiii. 347.—*K. diffusa* Rose et Painter in CNH. x. 107 (1906).
Cofradia, *Brandegee;* Ymala, *Palmer* 1671.

## CARYOPHYLLACEAE.

**Stellaria nemorum** *L.;* SBH. 270.
Sierra Madre, N.W. Mexico, *Seemann* 2145.

**Drymaria effusa** *A. Gray;* Zoe, v. 198.
Cofradia, *Brandegee.*

[**D. cordata** *Willd.*
Widely distributed in both hemispheres, but I have found no record for Sinaloa. It is recorded from Chihuahua, Durango, Jalisco, etc.]

### Portulacaceae.

**Portulaca oleracea** *L.*; SBH. 270.

Common about Mazatlan, where it is used as a potherb. Vernacular name "Verdolaga." Seemann did not definitely determine the species and, apparently, did not collect it. There can be little doubt, however, that it is *P. oleracea*, for which "Verdolaga" is the common name throughout Central and South America.

**P. suffrutescens** *Engelm.* in Coult. Bot. Gaz. vi. 236 (1881).—*P. stelliformis* Moc. et Sessé ex DC. Prod. iii. 353, in syn. Agiabampo, *Palmer* 804.

**Talinum paniculatum** (*Jacq.*) *Gaertn.*; CNH. xiii. 288.—*T. patens* Willd.

Near Rosario, on the road to Acaponeta, *Rose* 1853.

### Theaceae.

**Ternstroemia lineata** DC. Mém. Ternstroem. 17, t. 1 (1823); Choisy, Mém. Ternstroem. 17.—*T. Topegapote* Seem. Bot. Herald, 272 (1856), non *T. Tepezapote* Cham. et Schlecht.

Sierra Madre, on the road leading from Mazatlan to Durango.

### Malvaceae.

**Malva parviflora** *L.*; CNH. v. 180.

Colomas, *Rose* 1723. Vernacular name "Malva castilla."

**Malvastrum scabrum** *A. Gray*; CNH. i. 305.

Agiabampo, *Palmer* 790.

**M. tricuspidatum** *A. Gray*; CNH. v. 181.

Between Rosario and Concepcion, *Rose* 3263; Rosario, *Rose* 1597.

**Anoda crenatiflora** *Ort.*; Zoe, v. 213.—*A. parviflora* Cav.

Cofradia and Culiacan, *Brandegee*. San Ignacio, Arroyo de Campanillas, 375 m., *Gonzalez* 594.

**A. pentaschista** *A. Gray*; CNH. i. 305; Zoe, v. 213.

Agiabampo, *Palmer* 780; Culiacan, *Brandegee*.

**A. reticulata,** *S. Wats.*; Zoe, v. 213.

Cerro Colorado, *Brandegee*.

**Anoda urophylla** *Riley*, sp. nov.; affinis *A. caudatifoliae* Robinson et Greenman, foliis vix dentatis, pilis patentibus fulvis haud albis differt.

*Suffrutex*, ut videtur, caulibus fulvo-tomentellis pilis longioribus patentibus intersparsis. *Folia* cordato-ovata, apice caudato-acuminata, inconspicue dentata, 8·5–9·5 cm. longa, 6–6·5 cm. lata, membranacea, utrinque viridia, supra stellato-pubescentia, subtus densius stellato-pubescentia vel tomentella; petioli 8·5–9·5 cm. longi, breviter pubescentes pilis longioribus patentibus intersparsis. *Inflorescentia* paniculata terminalis. *Pedicelli* usque ad

8 mm. longi, obtecti, ut pedunculi, pilis fulvis longis patentibus. *Calyx* 6 mm. longus, dense pilosus, 10-nervis, venosus, haud ad medium 5-lobatus, lobis ovato-triangularibus acuminatis. *Petala* 12 mm. longa, unguiculis margine dense pilosis. *Stamina* 30. *Stylus* glaber in quinque ramos capitato-stigmatosos divisus. *Ovarium* 5-loculare, pericarpio membranaceo; ovula in loculis solitaria, pendentia. *Fructus* non visus est.

SINALOA: Choix; El Rincon, 670 m., *Gonzalez* 888 (type in Herb. Kew.). Vernacular name "Malva liza."

**Periptera punicea** DC.; Zoe, v. 212.—*Anoda periptera* (Sims) Hochr. in Ann. Conserv. et Jard. Bot. Genève, xx. 41 (1916). *Anoda punicea* Lag.; E. G. Baker in Journ. Bot. 1892, 74.
Cerro Colorado, *Brandegee*.

**Sida acuta** Burm.—*S. carpinifolia* L. f.; SBH. 271. *S. acuta* var. *carpinifolia* K. Schum.; CNH. v. 176.
Common along the coast, *Seemann*; Mazatlan, Rosario, and Colomas, *Rose* 1377, 3102, 3160, 3198. San Ignacio, El Espinal, 330 m., *Gonzalez* 528.
Typical *S. acuta* as depicted by Rheede, Rumphius and Plukenet seems to grade imperceptibly into the variety *carpinifolia*.

**S. aggregata** *Presl*; Zoe, v. 212.
Culiacan and Cofradia, *Brandegee*.

**S. alamosana** *S. Wats.*; Zoe, v. 212.
Culiacan and Cofradia, *Brandegee*.

**S. anomala** *St. Hil.*; Zoe, v. 212.
Culiacan, *Brandegee*.

**S. linifolia** *L.*
San Ignacio: Cerro de Potrerillo, 720 m., *Gonzalez* 611.

**S. lodiegensis** *E. G. Baker* in CNH. iii. 311 (1895); Zoe, v. 212.
Lodiego, *Palmer* 1577; Between Ymala and Cofradia, *Brandegee*.

**S. longifolia** *Brandegee* in Zoe, v. 212 (1905).
Cerro Colorado, *Brandegee*.

**S. rhombifolia** *L.*; SBH. 271.
Common along the coast, *Seemann*; San Ignacio: between Tacuitapa and Espinal, 340 m., *Gonzalez* 530. Vernacular name "Malva colorada."

**S. salviifolia** *Presl.*; Zoe, v. 212.
Culiacan, *Brandegee*.

**S. tragiifolia** *A. Gray*; CNH. v. 177.
Topolobampo, *Palmer* 199.

**Wissadula incana** *Brandegee* in Zoe, v. 210 (1905).
Culiacan, *Brandegee*.

**W. wissaduloides** (*E. G. Baker*) *Rose*; CNH. v. 179; Zoe, v. 210; R. E. Fries in Svensk. Vet.-Akad. Handl. xliii. no. 4,

84.—*Abutilon wissaduloides* E. G. Baker in CNH. iii. 312 (1895).

Ymala, *Palmer* 1720; Cofradia, *Brandegee*.

**Pseudabutilon paniculatum** (*Rose*) *R. E. Fries*, l.c. 104.—*Wissadula paniculata* Rose in CNH. v. 178 (1899): Zoe, v. 210.

Ymala, *Palmer* 1783; Cofradia and Culiacan, *Brandegee*.

**P. spicatum** (*H. B. K.*) *R. E. Fries*, l.c. 98.—*Wissadula spicata* Presl. *W. elongata* Brandegee in Zoe, v. 210 (1905).

Cofradia and Culiacan, *Brandegee*. San Ignacio: Campanillas, 590 m., *Gonzalez* 549. Vernacular name "Pelotazo."

**Abutilon crispum** *Medic.*; CNH. v. 170; Zoe, v. 212.

Altata, *Rose* 1336. Yervacito, *Brandegee*. San Ignacio: Los Chinacates, 370 m. *Gonzalez* 517. Vernacular names "Pelotazo," "Cotolahue."

**A. incanum** *Sweet*; CNH. i. 307; Zoe, v. 212.

Agiabampo, *Palmer* 768; Culiacan, *Brandegee*.

**A. membranaceum** *E. G. Baker* in CNH. iii. 312 (1895).—*Sida dumosa* Seem. Bot. Herald, 271, non Swartz.

Santa Lucia, *Seemann* 2146.

Seemann's 2146, like several other plants collected by him in the Sierra Madre, has been erroneously labelled "Panama" in Herb. Mus. Brit. It differs from the type of *A. membranaceum* in having the staminal tube pilose almost to the apex.

**A. triquetrum** *Presl.*; CNH. i. 307.

Agiabampo, *Palmer* 810.

**Malachra capitata** *L.*; Zoe, v. 212.

Culiacan, *Brandegee*.

**Malvaviscus arboreus** *Cav.*; SBH. 271.

Mazatlan, common, *Seemann*. [I have not seen Seemann's specimen.]

**M. rivularis** *Brandegee* in Zoe, v. 211.

Banks of the Cofradia River, *Brandegee*. Vernacular name "Media Noche."

**Kosteletzkya paniculata** *Benth.*; Zoe, v. 211.

Cerro Colorado, *Brandegee*. San Ignacio: Yxtagua, 650 m., *Gonzalez* 485.

**K. stellata** *Fernald* in Bot. Gaz. xx. 532 (1895).

Mazatlan, *W. G. Wright* 1241; Isla Piedra, Mazatlan, *Lamb* 374.

**Hibiscus Coulteri** *Harv.*; CNH. i. 308; CNH. v. 174; Zoe, v. 211.

Agiabampo, *Palmer* 779; Topolobampo, *Palmer* 192, a very large flowered form; Culiacan, *Brandegee*.

**H. violaceus** *Brandegee* in Zoe, v. 211 (1905).

Culiacan and Cofradia, *Brandegee*.

**Gossypium hirsutum** *L.;* Watt, Wild and Cultivated Cottons of the World, 183, t. 30.

Sinaloa, *Gonzalez* 669. Vernacular name "Algodon."

**Erioxylum aridum** *Rose et Standley* in CNH. xiii. 308 (1911).

Near Culiacan, *Rose, Standley and Russell* 14999; near La Rastra, *Goldman* 267.

## Bombacaceae.

**Bombax Palmeri** *S. Wats.;* CNH. v. 179.

Near Colomas, *Rose* 3215. San Ignacio: Paraje de los Sabinos, 500 m., *Gonzalez* 259. Vernacular name "Cuajilote."

**Ceiba grandiflora** *Rose;* CNH. v. 180.

Near Colomas, *Rose* 1705; near Rosario, *Rose* 3161.

**Ceiba pentandra** (*L.*) *Gaertn.*—*C. casearia* Medic.; CNH. v. 250. *Eriodendron anfractuosum* DC.

Concepcion, *Rose.*

## Sterculiaceae.

**Helicteres guazumifolia** *H. B. K.*—*H. mexicana* H. B. K.

Escuinapa: El ojo de Agua, 48 m., *Gonzalez* 1132. Vernacular name "Guasimilla."

**H. mollis** *Presl.;* Zoe, v. 213.

Cerro Colorado, *Brandegee.*

**Physodium corymbosum** *Presl.*

San Ignacio: Coyotitan, 280 m., *Gonzalez* 120. Vernacular name "Rechinador."

**Melochia hirsuta** *Cav.;* K. Schum. in Mart. Fl. Bras. xii. pars 3, 46.—*M. serrata* (Vent.) St. Hil. et Naud.; Zoe, v. 213.

Culiacan, *Brandegee.*

Brandegee recorded his specimen as *Melochia serrata* Benth. Hemsley (Biol. i. 130, 131) included *M. serrata* Benth. and *M. hirsuta* Cav. as separate species, but cited the same specimens under both names. The combination *Melochia serrata* (Vent.) was proposed by St. Hilaire and Naudin in 1842, two years before Bentham used it in the "Botany of the Sulphur." Schumann l.c. quoted Bentham as having used the name in Hook. Journ. Bot. iv. 130 (1842), but it does not occur there.

**M. speciosa** *S. Wats.;* Zoe, v. 213.

Between Altata and Culiacan, *Brandegee.*

**Waltheria acuminata** *Rose* in CNH. v. 183 (1899); Zoe, v. 213.

Culiacan, *Palmer* 1793; Cofradia, *Brandegee.*

**W. americana** *L.;* CNH. v. 184.

Mazatlan, *Rose* 1376.

**W. detonsa** *A. Gray.*

San Ignacio: between Tacuitapa and Espinal, 330 m., *Gonzalez* 529.

**Guazuma tomentosa** *H. B. K.* ?

San Ignacio : Rancho de los Humayes, 320 m., *Gonzalez* 444. Vernacular name "Guásima."

Gonzalez' specimen is without flowers and fruits, but appears to be conspecific with Herb. Berland. Texano-Mexicanum nos. 716 and 2133. *G. tomentosa* H. B. K., which was treated by K. Schumann (Mart. Fl. Bras. xii. pars 3, 81) as a synonym of *G. ulmifolia* Lam., differs from the latter not only in indumentum, but in the shape of the fruits, which are ellipsoid or oblong instead of globose.

**Buettneria carthaginensis** *Jacq.*

San Ignacio : San Agustin, Camino del Palmario 210 m., *Gonzalez* 619. Vernacular name "Arrendador."

**B. tiliifolia** *Presl.*; Zoe, v. 213.

Common about Culiacan, *Brandegee*.

TILIACEAE. F174

**Triumfetta dehiscens** *Rose* in CNH. xii. 285 (1909).

Near Colomas, *Rose* 1698.

**T. Goldmanii** *Rose*, l.c.

Sierra de Choix, *Goldman* 264.

**T. insignis** *S. Wats.*

San Ignacio : Yxtagua 480 m., *Gonzalez* 467. Vernacular names "Pastora," "Guachopure."

**Triumfetta Sanctae-Luciae** *Sprague*, sp. nov.; foliis parvis lanceolatis caudato-acuminatis glabris, inflorescentia paniculata, alabastris fere glabris circiter 1·8 cm. longis, nectariis androgynophori oblongis distincta.

*Ramuli* graciles, 1–1·5 mm. diametro 3 dm. infra apices, superne minute stellato-puberuli, mox glabrescentes, obscure brunnei. *Folia* lanceolata, basi rotundata vel leviter subcordata, acute caudato-acuminata, 2·5–5 cm. longa, 1–2 cm. lata, crenato-serrata serraturis glanduloso-apiculatis, glandulis 2 vel 4 inferioribus conspicuis, leviter discolora, nervis stellato-puberulis ceterum glabrata, basi trinervia vel subquinquenervia, nervis utrinque trijugis (iis caudae non inclusis), pergamentacea; petioli 1–2 cm. longi, minute stellato-pubescentes, 2–3 mm. infra laminam sursum incrassati; stipulae subulatae, circiter 2 mm. longae. *Paniculae* terminales, subaphyllae; rami primarii apice bracteas solitarias subfoliaceas anguste lanceolatas acuminatas 1·5–1·8 cm. longas 3·5–5 mm. latas gerentes, inferiores ter ramificati, pluriflori; pedicelli 5–7 mm. longi, graciles. *Sepala* circiter 1·8 cm. longa, inferne 1·5 mm. lata et ciliata, superne 0·6 mm. lata, extra glabra, apice cornuta cornibus 0·75 mm. longis. *Petala* anguste lanceolata, circiter 1 cm. longa, 1·5 mm. lata, ungue 1·5 mm. longo villoso. *Androgynophorum* 0·8 mm. longum nectariis oblongis non contiguis 0·5–0·6 mm. longis.

*Annulus* 0·2 mm. longus, ciliatus. *Stamina* circiter 20; filamenta inferne pilosa; antherae 0·8 mm. longae. *Ovarium* triloculare; stylus circiter 1·8 cm. longus. *Fructus* (immaturus) dense aculeatus; aculei spinulis solitariis rectis terminati.—*T. grandiflora* Seem. Bot. Herald, 272, non Vahl. *T. polyandra* Hemsl. Biol. Centr.-Amer., Bot. i. 138, partim, non DC.

SINALOA: Santa Lucia, about 1,200 m., November 1849, *Seemann* 2147 (type in Herb. Kew.).

**Heliocarpus attenuatus** *S. Wats.*

Choix: Tasajera, 420 m., *Gonzalez* 860. Vernacular name "Zamo baboso."

**H. glaber** *Brandegee* in Zoe, v. 209 (1905).

Cerro Colorado; Humaya River near Culiacan, *Brandegee.*

**Corchorus pilolobus** *Link;* CNH. i. 310.—*C. hirtus* var. *pilolobus* K. Schum. in Mart. Fl. Bras. xii. pars 3, 128, pro parte (excl. syn. *C. tortipes* St. Hil.).

Agiabampo, *Palmer* 763.

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# X. DECADES KEWENSES.

## PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

## DECAS CVII.

1061. **Orophea torulosa** *Hutchinson* [Anonaceae–Miliuseae]; affinis *O. enterocarpae* Hk. f. & Thoms., sed ramulis ultimis robustioribus elongatis, foliis late ellipticis majoribus, fructus segmentis multo brevioribus differt.

*Ramuli* elongati, glabri, nitentes, internodiis circiter 4 cm. longis. *Folia* late elliptica, abrupte et longe acuminata, basi rotundata, 9–14 cm. longa, 4–6 cm. lata, chartacea, supra glabra, infra parce pilosa vel demum glabra, costa prominente appresse pilosa; nervi laterales utrinsecus circiter 8, a costa sub angulo 45° abeuntes, intra marginem conjuncti, infra prominentes; petioli crassi, circiter 3 mm. longi, transverse rugosi et parce setosi. *Flores* axillares, subsessiles. *Sepala* anguste triangularia, acuta, 2 mm. longa, appresse pilosa. *Petala* exteriora late ovata, acuta, 3 mm. longa, dense ciliolata, extra parce puberula, intra glabra, interiora multo longiora, basi late aperta, superne conniventia et crasse carnosa, recurva, parce puberula. *Antherae* curvatae, 1 mm. longae, connectivo triangulare. *Carpella* glabra, compressa. *Fructus* torulosus, circiter 7 cm. longus, segmentis vix 1 cm. longis et 7 mm. crassis.

MIDDLE ANDAMAN ISLANDS: 15 March, 1913, *C. E. Parkinson* 10.

1062. **Aeschynomene bracteolaris** *Riley* [Leguminosae-Hedysareae]; affinis *Æ. amorphoidi* Rose, foliis angustioribus, calyce pubescente, bracteolis majoribus, et inflorescentia differt.

*Fruticulus* erectus, inermis, caulibus breviter pubescentibus. *Folia* 4–5 cm. longa, petiolata, pennivenia, 22–26-juga; foliola oblongo-linearia, 5 mm. longa, 1·5 mm. lata, utrinque appresse pubescentia, basi oblique rotundata, apice acuta, valde mucronata, mucrone circiter 1 mm. longo. *Inflorescentiae* ramosae, ramulos foliatos circiter 10 cm. longos terminantes; ramuli inferiores inflorescentiae 5–8 cm. longi, superiores circiter 1 cm. longi. *Stipulae* parvae caducae. *Pedunculi* pluriflori, hirsuti. *Bracteolae* rotundatae, pubescentes, ciliatae, fere dimidium longitudinis calycis aequantes. *Flores* 5 mm. longi. *Calyx* pubescens, lobis rotundatis ciliatis. *Corolla* glabra. *Ovarium* sparse ciliatum, attenuatum.

Mexico Sinaloa: San Ignacio; El Coacoyal, *Gonzalez* 586 (type).

1063. **Vaccinium Gonzalezii** *Riley* [Vacciniaceae-Vaccinieae]; affinis *V. angustifolio* Benth., foliis latioribus lanceolatis tenuioribus, bracteolis medio pedicellorum insertis, calycis lobis haud acuminatis, inflorescentiis brevibus ramulos foliatos non terminantibus differt.

*Fruticulus* ramis puberulis. *Folia* lanceolata, 2–3 cm. longa, 8–10 mm. lata, conspicue dentata, breviter obtuse apiculata, vix coriacea, utrinque glabra, costa supra excepta, nervis venulisque prominentibus. *Racemi* 2–3 cm. longi, pubescentes, non foliati, a basi ad apicem floriferi. *Bracteae* plus minusve subfoliaceae, glanduloso-dentatae, ciliatae. *Pedicelli* axillares, solitarii, brevissimi, pubescentes. *Bracteolae* lineari-lanceolatae, valde ciliatae, medio pedicelli insertae. *Flores* parvi, sed in alabastro tantum visi. *Calycis lobi* deltoidei, superne valde ciliati. *Antherae* dorso barbatae, apice loborum longe aristatae.

Mexico. Sinaloa: San Ignacio; Mesa de Bueso, 1250 m. *Gonzalez* 839 (type). Vernacular name "Madroño chino."

1064. **Torenia courtallensis** *Gamble* [Scrophulariaceae-Gratioleae]; *T. cordifoliae* Roxb., affinis sed decumbens nec erectus, calycibus anguste oblongis, pedicellis longioribus et foliorum petiolis brevioribus differt.

*Herba*, verosimiliter perennis, ramis tetragonis longis decumbentibus ad nodos radicantibus. *Folia* triangulari-ovata, apice acuta, basi obtusa, crenato-serrata, supra praecipue margines versus hispida, subtus fere glabra, 4-5 cm. longa, 2 cm. lata; petiolus 3–10 mm. longus, hispidus. *Flores* axillares, parvi, pedicellis gracilibus 3–6 cm. longis. Calyx anguste oblongus, alatus, circiter 1 cm. longus, alis ciliatis exceptis glaber, lobis lanceolatis apice tortis. *Corolla* calyce bis longior, lilacina, lobis inferioribus purpureo-maculatis. *Stamina* inferiora filamentis appendice clavato instructis. *Capsula* oblonga, apice acuminata, 7 mm. longa, seminibus rugosis.—*T. cordifolia* Hook. f., Fl. Br. Ind. iv. 276, partim, non Roxb.

S. India, Courtallum and Sivagiri hills in Tinnevelly, *Wight* K.D. 2378, Hb. propr. 2205, 2476; Kannikatti, Tinnevelly, *Barber* 2997; Naterikal to Singalteri, 1200 in. alt. *Hooper and Ramaswami* 3807; High Wavy Mountain, Madura 1300–1500 m. *Blatter and Hallberg* 504. Travancore hills, *T. F. Bourdillon* 345.

1065. **Buchnera minor** *Riley* [Scrophulariaceae-Gerardieae]; affinis *B. mexicanae* Hemsley, foliis latioribus trinerviis nonnunquam paucidentatis, bracteolis quam bractea conspicue brevioribus, calycis dentibus longioribus, corolla minore tubo breviore differt.

*Herba* erecta, scabra, caulibus simplicibus vel superne pauciramosis, 5–7 dm. longis. *Folia* linearia-lanceolata, 2–4·5 cm. long, 2·5–6 mm. lata, trinervia, scabra, nonnulla paucidenta; folia superiora linearia. *Spicae* multiflorae, paribus florum satis approximatis. *Bracteae* 5·5–6 mm. longae; bracteolae 3–4 mm. longae. *Flores* brevissime pedicellati. *Calyx* dentibus inclusis 8 mm. longus, decem nervis setosis exceptis glaber, dentibus subulatis inaequalibus, 2·5–3·5 mm. longis. *Corolla* fauce barbata excepta glabra, tubo 1 cm., lobis 8 mm. longis. *Capsula* 6 mm. longa, glabra, seminibus sulcatis.—*B. mexicana* var. *minor* Hemsley, Biol. Centr.-Amer. Bot. ii. p. 457 (1882).

Mexico. Sinaloa: near Mazatlan; Cerro de Pinal, *Seemann* 1506 (type); Municip. San Ignacio: between Agua Fria and Ixtagua, 330 m., *Gonzalez* 697. West Mexico, *Seemann* (Herb. Benth.). Vernacular name "Tinterillo."

1066. **Didymocarpus Fischeri** *Gamble* [Gesneriaceae-Didymocarpeae]; *D. Rottlerianae* Wall. affinis, foliis profunde crenato-lobulatis sed scapo longiore, corolla majore et capsula longiore et crassiore differt.

*Herba* scapigera acaulis. *Folia* obovato-spathulata, apice obtusa, base attenuata et petiolum alatum formantia, profunde (saepe ad 1 cm.) crenata, crenaturis latissimis crenulatis, supra minute bullata et pilorum alborum fasciculis mollibus ornata, infra etiam praecipue in junioribus lanata, 12–14 cm. longa, 6–8 c.m. lata; nervi utrinque circiter 7, cito ramosi; petiolus cum alis 1 cm. ultra latus. *Scapi* 2–5, erecti, pedunculis pubescentibus ad 24 cm. longis, deinde dichotome bifidi. ramulis racemosis paucifloris, pedicellis gracilibus, fructiferis 2–3 cm. longis. *Calyx* longe villosus, lobis lineari-lanceolatis 2–3 mm. longis. *Corolla* late campanulata, paullo ventricosa, lobis patentibus, 1–1·5 cm. longa, verosimiliter lilacina. *Ovarium* villosum, stylo superne glabro, stigmate bilobo. *Capsula* linearis, acuta, ad 3 cm. longa, minute villosa.

South India. Anamalai Hills; Coimbatore District, 500-600 m. alt. *C. E. C. Fisher* Aug. 1915.

1067. **Calanthe pubescens** *Ridley* [Orchidaceae-Epidendreae]; *C. veratrifoliae* affinis, sed foliis et scapo dense pubescentibus, labelli epichilio profunde bilobo, lobis spathulatis, unguiculatis.

*Herba*, 60 cm. alta. *Folia* herbacea, elliptica, acuminata, ad basim angustata, 30 cm. longa, 10 cm. lata, subtus pubescentia, nervis prominulis 7, petiolo 15 cm. longo dense pubescente. *Scapus* 45 cm. altus, dense pubescens, parte florifera 15 cm. longa. *Bracteae* persistentes, lanceolatae, acuminatae, superiores ovatae, acuminatae, 1 cm. longae, basi 4 mm. latae. *Flores* plures, congesti, pedicellis 2 cm. longis pubescentibus. *Sepala* oblongo-ovata, acuta, extus puberula. *Petala* lateralia sepalis similia, minora; labellum 1 cm. longum, lobis lateralibus oblongis apicibus rotundatis brevibus, epichilio (lobo medio) profunde bilobo, ungue longo angusto, lobis spathulatis unguiculatis apicibus subabrupte rotundatis, callis 7–8 in ungue uniseriatis tuberculiformibus, calcare gracillimo filiformi 1 cm. longo. *Columna* basi angustata, superne incrassata. *Anthera* ovata, acuta.

Malay Peninsula. Jalor, Buket Besar, in sylvis, alt. 600 m. *Gwynne-Vaughan* 261.

An unusually pubescent plant, almost velvety on the petiole, with a deep-cut terminal lobe, and almost racket-shaped lobules.

1068. **Vanda punctata** *Ridley* [Orchidaceae-Vandeae]; *V. hastiferae* Reichb. f. affinis, sed floribus parvis et labio lato lyrato piscis caudae instar insignis.

*Caulis* validulus, eo *V. insignis* similis. *Folia* angusta, lorata, inaequaliter biloba lobis acutis, 11 cm. longa, 0·7 mm. lata, costa in mucronulo producta. *Racemus* sexflorus, 15 cm. longus. *Bracteae* parvae, ovatae. *Pedicelli* cum ovariis gracilibus 3 cm. longi. *Flores* patuli, 2 cm. lati. *Sepalum* posticum angustum, apice incurvo, lateralia oblonga, spathulata, angusta. *Petala* falcata, spathulata, aequilata, omnia flava, rubro-punctata in dorso flavescentia. *Labellum* album, ovatum, lobis lateralibus brevibus oblongis falcatis, epichilio ovato latiore versus apicem angustato, apice dilatato bilobo instar caudae piscis, calcare conico horizontale brevi, callo in are sito truncato quadrangulari sub trilobo. *Columna* lata, alba, brevis crassa, subquadrata. *Anthera* ovata, plana. *Pollinia* reniformia, vel ovata, aurantiaca, caudiculo oblongo lato, disco magno quadrato atrorubente. *Stigma* ovoideum. *Rostellum* breve, latum, ovatum.

Malay Archipelago. Wetter Island. This new Vanda was found in a consignment of *Vanda insignis* Blume sent from Wetter Island near Timor in the Eastern Malay Archipelago, by Mr. Pereira of Singapore. It flowered in June 1897, and it is described here from the drawings and notes taken at that time.

1069. **Habenaria** (Sect. **Platyglossa**) **medioflexa** *Turrill* (Orchidaceae-Ophrydeae); affinis *H. trichosanthae*, Wall., sed bracteis receptaculo (ovario) aequilongis vel longioribus, floribus minoribus, labelli segmento medio lateralibus breviore reflexo distinguitur.

*Herba* erecta, pedalis vel ultra, caule tereto glabro. *Folia caulina* lanceolata apice attenuata, acuta, 7 cm. longa, 1·7 cm.

lata, glabra. *Racemus* circiter 10-florus, 9 cm. longus, glaber; bracteae lineari-lanceolatae, acutissimae, usque ad 3 cm. longae et 3 mm. latae. *Receptaculum* (ovarium) 2·2 cm. longum. *Sepalum posticum* ovatum, 6 mm. longum, 4 mm. latum, trinervatum. *Sepala lateralia* inaequaliter ovata, acuta, 7 mm. longa, 5 mm. lata, 5-nervata. *Petala lateralia* anguste linearia, 5 mm. longa, uninervata. *Labellum* trilobatum, lobis lateralibus fere ad basim in segmentis numerosis angustissime linearibus divisis, 1·4 cm. longis, lobo medio lineare 1 cm. longo reflexo; calcar sigmoideum, in parte proxima 1 cm. longum fere capillaceum, in parte distale 2·5 cm. longum. *Antherae loculi* clavati 5 mm. longi. *Stigmata* triangularia, 2·5 mm. longa.

Described from a specimen cultivated in the Botanic Gardens, Singapore. Mr. I. H. Burkill informs us that it was originally collected at Pungah, Lower Siam, by Mohammed Haniff and Mohammed Nur, and a specimen, under the number 3858, is preserved in the Singapore Herbarium.

1070. **Curcuma sulcata** *Haines* [Zingiberaceae-Hedychieae]; *C. angustifoliae* Roxb. affinis sed foliis ellipticis et plicatis (sulcatis) et juventute supra puberulis differt, bractearum forma coloreque et florum colore etiam quodammodo distincta.

*Rhizoma* 5–8 cm. longum extus brunneum intus pallide flavum, leviter aromaticum, filipendulum; tubera sessilia 0. *Folia* elliptica vel elliptico-oblonga, inter nervos sulcata, 20–40 cm. longa, 9–16 cm. lata, basi inaequalia, apice caudata ad 1–2 cm., supra viridia juventute in nervis puberula, subtus pallidiora et minutissime albo-punctata. *Petioli* ad 20 cm. longi, virides vel rubescentes. *Spica* 9–15 cm. longa, vere a latere sed aestate inter folia nascente, pedunculo brevi. *Bracteae* floriferae 2·5–4 cm. longae, parte libera 1·2–2 cm. longa, rubescenti vel viridi-brunnea vel apice purpurea; bracteae steriles 4 cm. longae, 0·5–1·2 cm. latae, summae angustiores, lineari-oblongae, apicibus rotundatis, versus apices violaceae et minute pubescentes. *Flores* e bracteis 1–2 cm. exserti. *Ovarium* subglobosum hirsutum, pilis brunneis. *Calyx* 8 mm. longus pallide-puniceus dentibus obtusis. *Corollae* tubus albus et tenuis usque ad 1 cm. longitudinem deinde ventricosus; lobi rubescentes vel saturate rubri, 2·5 cm. longi, lobo dorsali acute mucronato. *Staminodia* lateralia alba vel pallide flava rubrotincta oblonga quodammodo sursum versus latiora, 8 mm. lata corollam leviter superantia. *Labium* ovatum apice abrupte angustato obtuso rotundato ad 3–4 mm. fisso, ut staminodia coloratum sed ad medium saturate flavum. *Stamen* dorso puberulum.

India. Central Provinces, in the Vindhyan Mountains, elevation 200-300 m. *Haines* 170 P.

Specimens of the plant were collected in May and June in flower and grown on by me until the leaves were mature. It was then found to flower again from the centre of the leaves as described by Roxburgh in the case of *C. rubescens*, of which I took it to be a variety lacking the deep red midrib of that species.

So far as I am aware Roxburgh's *C. rubescens* is known only from his description and unpublished drawings. The last depict a glabrous ovary. If the entirely glabrous condition of the ovary in the figure is not an omission of the artist, the character is an important one and our plant is not closely allied to *C. rubescens*. The alliance with *C. angustifolia* is very close as the bracts and flowers of that species are sometimes pretty deeply coloured.

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## XI.—ADDITIONS TO THE INDEX KEWENSIS.

Though every care is taken to make the successive supplements of the Index Kewensis as complete as possible, some names have been unavoidably omitted owing to no copies of the works in which they were published being available for consultation. This was the case with the second edition of Sturm's Flora von Deutschland (Stuttgart, 1900–1906), which contained about 750 new names proposed by E. H. L. Krause. These have now been listed by Mr. Sprague for inclusion in the sixth supplement of the Index Kewensis, a copy of Krause's work having been lent to Kew for the purpose by Mr. C. E. Salmon.

In view of the large number of new names proposed by Krause and of the fact that some have been inadvertently duplicated by later authors, it seems desirable to publish a condensed list, pending the appearance of the sixth supplement. The date of publication is given after the generic name, and the synonyms are added in brackets after the specific names.

Most of the new combinations proposed by Krause are the result of his adoption of a very wide generic concept. Thus he included all genera of *Cruciferae* under the generic name *Crucifera*, and united *Lycium*, *Atropa*, *Physalis* and *Nicandra* in an aggregate genus *Boberella*. Krause reserved the specific names *hybridus* and *dubius* for hybrids and doubtful plants respectively. Thus *Papaver dubium* E. H. L. Krause (not of Linn.) is any doubtful *Papaver*, and *Chenopodium hybridum* denotes any hybrid *Chenopodium*. Such names have not been included in the present list, but will appear in the Supplement. Missbach and E. H. L. Krause are joint authors of the new combinations under *Carex* and *Cyperus*: for the remainder Krause is responsible.

**Actaea** (1901).
Xanthorrhiza (X. apiifolia).

**Agrimonia** (1904).
falsa (agrimonioides).

**Aldrovandia** (1902).
generalis (vesiculosa).

**Alsine** (1901).
alpina (Cerastium a.).
arvensis (Cerastium a.).
brachypetala (Cerastium b.).
corniculata (Cerastium c.).
Friesiana (Stellaria F.).
glauca (Stellaria g.).
glomerata (Cerastium g.).
holosteoides (Lepyrodiclis h.).
latifolia (Cerastium l.).
mantica (Cerastium m.).
multicaulis (Stellaria m.).
pellucida (Cerastium p.).
polygonoides (Arenaria p.).
quarternella (Moenchia q.).
silvatica (Cerastium s.).
tetrandra (Cerastium t.).
tomentosa (Cerastium t.).
trivialis (Cerastium t.).
uliginosa (Stellaria u.).
viscida (Stellaria v.).

Amarantus (1901).
arvensis (Digera a.).

Amsinckia (1903).
media (A. intermedia).

Anagallis (1901).
minima (Centunculus m.).

Anchusa (1903).
primuliflora (Alkanna p.).

Anemone (1901).
Atragene (Atragene alpina).
Flammula (Clematis F.).
integrifolia (Clematis i.).
recta (Clematis r.).
Vitalba (Clematis V.).
Viticella (Clematis V.).

Aquilegia (1901).
thalictroides (Isopyrum t.).

Aster (1905).
ambiguus (Conyza a.).
Bellis (Bellis perennis).
canadensis (Erigeron c.).
Erigeron (Erigeron acer).
glabratus (Erigeron g.).
rupestris (Erigeron alpinus).
Stenactis (Stenactis annua).
uniflorus (Erigeron u.).
Villarsii (Erigeron V.).

Astragalus (1901).
alpinus (Phaca a.).
phacinus (A. alpinus *Linn.*).

Bartsia (1903).
litoralis (Euphrasia l.).

Bidens (1905).
leucanthemus (Coreopsis l.).
Tripteris (Coreopsis T.).

Boberella (1903).
Alkekengi (Physalis A.).
angulata (Physalis a.).
Belladonna (Atropa B.).
halimifolia (Lycium h.).
lanceolata (Physalis l.).
peruviana (Physalis p.).
pubescens (Physalis p.).
rhombifolia (Lycium r.).

Bryonia (1904).
Elaterium (Momordica E.).
monoeca (B. alba).

Calla (1906).
generalis (C. aethiopica).

Cannabis (1905).
generalis (C. sativa).

Carduus (1906).
Cynara (Cynara Cardunculus).
nemoralis (Cirsium n.).

Carex (1900).
Kobresia (Kobresia caricina).
scirpina (Kobresia s.).

Caucalis (1904.).
microcarpa (Torilis m.).
neglecta (Torilis n.).

Centaurea (1906).
Carthamus (Carthamus tinctorius).
pseudobenedicta (Cnicus p.).
Saussurea (Saussurea alpina).

Centaurium (1903).
filiforme (Microcala f.).
perfoliatum (Chlora p.).
pulchellum (Erythraea p.).
serotinum (Chlora s.).

Chamaemelum (1905).
achilleifolium (Chrysanthemum a.).
achilleum (Achillea nobilis)
alpinum (Chrysanthemum a.).
altissimum (Anthemis a.).
atratum (Achillea a.).
aureum (Cotula a.).
Balsamita (Tanacetum B.).
cartilagineum (Achillea c.).
Chamomilla (Matricaria C.).
Cladanthus (Cladanthus arabicus).
Clavennae (Achillea C.).
coarctatum (Achillea c.).
coronarium (Chrysanthemum c.).
coronopifolium (Chrysanthemum c.).
corymbosum (Chrysanthemum c.).
crithmifolium (Achillea c.).
Gerberi (Achillea G.).
Leucanthemum (Chrysanthemum L.).
leucocephalum (Gymnocline l.).
macrophyllum (Achillea m.).
Millefolium (Achillea M.).
Myconis (Chrysanthemum M.).
Parthenium (Matricaria P.).
Ptarmica (Achillea P.).
radiatum (Anacyclus r.).
ruthenicum (Anthemis r.).
segetum (Chrysanthemum s.).
suaveolens (Chrysanthemum s.).
tanacetifolium (Achillea t.).
Tanacetum (Chrysanthemum T.).
tomentosum (Achillea t.).

Chenopodium (1901).
agreste (C. album).
angustifolium (Atriplex a.).
arenarium (Atriplex a.).
Dethardingianum (Atriplex littorale).
hortense (Atriplex h.).
latifolium (Atriplex l.).
oblongifolium (Atriplex o.).
oleraceum (Spinacia o.).
pedunculatum (Atriplex p.).
roseum (Atriplex r.).
tataricum (Atriplex t.).

Cichorium (1906).
Aposeris (Aposeris foetida).
Arnoseris (Arnoseris pusilla).
barbatum (Tolpis b.).
Rhagadiolus (Rhagadiolus edulis).

Convallaria (1906).
amplexifolia (Uvularia a.).

Coriandrum (1904).
radians (Bifora r.).

Coronilla (1901).
comosa (Hippocrepis c.).
compressa (Ornithopus c.).
ebracteata (Ornithopus e.).
perpusilla (Ornithopus p.).
serradella (Ornithopus sativus).

Crocus (1906).
parviflorus (C. vernus, var. p.).

Crucifera (1902).
Aethionema (Aethionema saxatile).
africana (Malcolmia a.).
aizoides (Draba a.).
albida (Arabis a.).
aleppica (Erucaria a.).
Alliaria (Erysimum A.).
alpestris (Arabis ciliata.
altissima (Sisymbrium a.).
alyssoides (Alyssum campestre).
Alyssum (Alyssum montanum).
amara (Cardamine a.).
amphibia (Nasturtium a.).
apetala (Lepidium a.).
Arabis (Arabis alpina).
arcuata (Barbarea a.).
arenosa (Arabis a.).
argentea (Alyssum a.).
Armoracia (Cochlearia A.).
Aubrieta (Aubrietia deltoidea).
auriculata (Arabis a.).
austriaca (Erysimum a.).
Barbaraea (Erysimum B.).
bellidifolia (Arabis b.).
bellidoides (Arabis b.).
Berteroa (Berteroa incana).
Biscutella (Biscutella laevigata).
Boreava (Boreava orientalis).
Brassica (Brassica oleracea).
bulbifera (Cardamine b.).
Cakile (Bunias C.).
calycina (Alyssum c.).
Camelina (Camelina sativa).
canescens (Erysimum canescens).
Capsella (Capsella Bursa-pastoris).
capselloides (Draba muralis).
Cardamine (Cardamine hirsuta).
Cardaria (Cardaria Draba).
Cheiranthus (Brassica C.).
Cheiri (Cheiranthus C.).
Cochlearia (Cochlearia Linnaei).
coerulea (Arabis coerulea).
coerulescens (Thlaspi c.).
Columnae (Sisymbrium C.)
Conringia (Conringia orientalis).
contracta (Arabis c.).
Corvini (Crambe C.).
Crantziana (Arabis C.).
crepidifolia (Erysimum c.).
cuspidata (Syrenia c.).
danica (Cochlearia d.).
Diplotaxis (Diplotaxis muralis).
dissecta (Sinapis d.).
divaricata (Iberis d.).
diversifolia (Lepidium perfoliatum).
eckartsbergensis (Sisymbrium e.).
edentula (Alyssum e.).
elongata (Brassica e.).
enneaphylla (Dentaria e.).
Erophila (Erophila vulgaris).
erratica (Rapistrum glabrum).
Eruca (Eruca sativa).
Erucago (Bunias E.).
erucoides (Diplotaxis e.).
Erysimum (Erysimum cheiranthoides).
Euclidium (Euclidium syriacum)
fontana (Cardamine f.).
frigida (Draba f.).
Gerardi (Arabis G.).
graminifolia (Lepidium g.).
grandiflora (Camelina g.).
Halleri (Arabis H.).
heptaphylla (Dentaria h.).
hieracifolia (Erysimum h.).
Hirschfeldia (Hirschfeldia adpressa).
Hornungia (Hornungia petraea).
Hutchinsia (Hutchinsia alpina).
Iberis (Iberis amara).
Impatiens (Cardamine I.).
Ionopsidium (Ionopsidium acaule).
Irio (Sisymbrium I.).
Isatis (Isatis tinctoria).
Johannis (Draba J.).

juncea (Brassica j.).
Kernera (Kernera saxatilis,.
Koniga (Koniga maritima).
Laelia (Laelia orientalis).
Lamarckii (Erucastrum Lamarckii).
Lampsana (Sinapis alba).
latifolia (Lepidium l.).
lepidioides (Lepidium heterophyllum).
Lepidium (Lepidium campestre).
linicola (Camelina l.).
Loeselii (Sisymbrium L.).
Lunaria (Lunaria annua).
Malcolmia (Malcolmia maritima).
maritima (Crambe m.).
matronalis (Hesperis m.).
media (Barbarea intermedia).
montana (Thlaspi m.).
multifida (Sisymbrium canescens)
Myagrum (Myagrum perfoliatum).
Napus (Brassica N.).
Nasturtium (Lepidium sativum).
nemorosa (Draba n.).
Neslia (Neslia paniculata).
novemfolia (Dentaria glandulosa).
odorata (Iberis o.).
palustris (Nasturtium p.).
pannonica (Erysimum p.).
parviflora Cardamine p.).
pauciflora (Arabis p.).
pendula (Arabis p.).
pentaphylla (Dentaria p.).
perfoliata (Thlaspi p.).
Petrocallis (Petrocallis pyrenaica).
pinnata (Iberis p.).
Pollichii (Erucastrum P.).
praecox (Barbarea p.).
pratensis (Cardamine p.).
procumbens (Capsella p.).
Psilonema (Psilonema minimum).
pumila (Arabis p.).
pyrenaica (Nasturtium p.).
Rapa (Brassica R.).
Raphanistrum (Raphanus R.).
rapistra (Rapistrum perenne).
rediviva (Lunaria r.).
repanda (Erysimum r.).
resedifolia (Cardamine r.).
Roripa (Roripa austriaca).
rostrata (Alyssum r.).
rotundifolia (Thlaspi r.).
rubella (Capsella r.).
ruderalis (Lepidium r.).
Ruellii (Coronopus R.).
rugosa (Rapistrum r.).
Sauteri (Draba S.).
saxatilis (Alyssum s.).
semperflorens (Iberis s.).
Senebiera (Senebiera pinnatifida).
silvestris (Nasturtium s.).
Sinapis (Sinapis nigra).
sinapistra (Brassica S.).
Sisymbrium (Sisymbrium officinale).
Sophia (Sisymbrium S.).
stricta (Barbarea s.).
strictissima (Sisymbrium s.).
Subularia (Subularia aquatica).
supina (Sisymbrium s.).
Teesdalea (Teesdalea nudicaulis).
tenella (Raphanus t.).
tenuifolia (Diplotaxis t.).
Thaliana (Arabis T.).
Thlaspi (Thlaspi arvense).
thlaspoides (Thlaspi alliaceum).
trifolia (Cardamine t.).
tristis (Hesperis t.).
tomentosa (Draba t.).
Turritis (Turritis glabra).
umbellata (Iberis u.).
umbrosa (Arabis u.).
utriculata (Alyssum u.).
viminea (Diplotaxis v.).
virginica (Lepidium v.).
Wahlenbergii (Draba W.).
wolgensis (Sisymbrium w.).

Cryptomeria (1906).
generalis (C. japonica).

Cucumis (1904).
vulgaris (Citrullus vulgaris).

Cynoglossum (1903).
patulum (Lappula p.).

Cyperus (1900).
compressus (Schoenus c.).
fluitans (Scirpus f.).
Holoschoenus (Scirpus H.).
lacustris (Scirpus l.).
maritimus (Scirpus m.).
multicaulis (Scirpus m.).
ovatus (Scirpus o.).
paluster (Scirpus p.).
parvulus (Scirpus p.).
pauciflorus (Scirpus p.).
pungens (Scirpus p.).
radicans (Scirpus r.).
rufus (Scirpus r.).
setaceus (Scirpus s.).
silvaticus (Scirpus s.).
supinus (Scirpus s.).
Tabernaemontani (Scirpus T.).
triqueter (Scirpus t.).
uniglumis (Scirpus u.).

Daphne (1902).
Passerina (Stellera P.).

Daucus (1904).
Caucalis (Caucalis daucoides).
infestus (Scandix i.).
latifolius (Laserpitium l.).
microcarpus (Torilis m.).
nodosa (Tordylium n.).
prutenicus (Laserpitium p.).
Siler (Laserpitium S.).
Turgenia (Turgenia latifolia).

Delphinium (1901).
paniculatum (Aconitum p.).

Diclytra (1902).
cirrosa (Adlumia fungosa).

Dictamnus (1902).
generalis (D. albus).

Drosera (1902).
media (D. intermedia).

Elatine (1902).
gyrosperma (E. Hydropiper).

Epipogon (1905).
generalis (E. aphyllus).

Euonymus (1902).
scandens (Celastrus s.).

Eupatorium (1905).
albifrons (Cacalia a.).
conyzoides (Ageratum c.).
viride (Adenostyles v.).

Filago (1905).
leontopodioides (Micropus erectus).

Fumaria (1902).
ochroleuca (Corydalis o.).

Galium (1904).
azureum (Asperula a.).
molluginoides (Asperula m.).
Rubia (Rubia tinctorum).
Sherardia (Sherardia arvensis).
sherardiiflorum (Asperula arvensis).
stylosum (Crucianella s.).

Genista (1901).
capita (Cytisus c.).
elongata (Cytisus e.).
europaea (Ulex e.).
Laburnum (Cytisus L.).
nigricans (Cytisus n.).
purpurea (Cytisus p.).
ratisbonensis (Cytisus r.).
sessilifolia (Cytisus s.).

Gentiana (1903).
Swertia (Swertia perennis).

Geum (1904).
octopetalum (Dryas o.).

Glaux (1901).
generalis (G. maritima).

Gnaphalium (1905).
alatum (Ammobium a.).
luteolum (G. luteo-album).

Hedysarum (1901).
gallicaput (Onobrychis Caput-galli).

Helianthus (1905).
fulgidus (Rudbeckia f.).
hirtus (Rudbeckia h.).
laciniatus (Rudbeckia l.).
pinnatus (Rudbeckia p.).

Hieracium (1906).
achyrophorum (Achyrophorus maculatus).
Andryala (Andryala integrifolia).
Apargia (Apargia Taraxaci).
aristatum (Scorzonera a.).
squamosum (Leontodon s.).
Chondrilla (Chondrilla juncea).
Cicerbita (Cicerbita macrophylla).
Cichorium (Cichorium Intybus).
corniculatum (Taraxacum c.).
glabrum (Hypochoeris g.).
Helminthia (Helminthia echioides).
Lactuca (Lactuca Scariola).
Lampsana (Lapsana communis).
Leontodon (Leontodon Taraxacum).
leucorrhizum (Tragopogon porrifolius).
majus (Tragopogon m.).
Mulgedium (Mulgedium alpinum).
Mycelis (Mycelis muralis).
nemausense (Andryala n.).
nicaeënse (Crepis n.).
oporinum (Oporinia autumnalis).
palustre (Sonchus p.).
picridoides (Picris pyrenaica).
Picris (Picris hieracioides).
Plumieri (Sonchus P.).
podospermoides (Podospermum octangulare).
Podospermum (Podospermum laciniatum).
Prenanthes (Prenanthes purpurea).

proteiforme (Leontodon p.).
quercinum (Lactuca q.).
radicatum (Hypochoeris r.).
salignum (Lactuca s.).
salinum (Taraxacum s.).
Scorzonera(Scorzonera hispanica).
scorzoneroides (Scorzonera humilis).
setosum (Crepis s.).
Sonchus (Sonchus asper).
squasmosum (Leontodon s.).
subcoeruleum (Scorzonera purpurea).
taraxacifolium (Crepis t.).
Tauschii (Crepis chondrilloides).
Thrincia (Thrincia hirta).
Tragopogon (Tragopogon pratensis).
uniflorum (Hypochoeris u.).
vimineum (Prenanthes v.).
virens (Crepis v.).
virosum (Lactuca v.).

Hippuris (1901).
generalis (H. vulgaris).

Hyacinthus (1906).
amoenus (Scilla a.).
autumnalis (Scilla a.).
bifolius (Scilla b.).
Boucheanus (Ornithogalum B.).
Cyrilli (Ornithogalum montanum)
italicus (Scilla i.).
Kochii (Ornithogalum K.).
myogalea (Ornithogalum nutans).
neglectus (Muscari n.).
sulfureus (Ornithogalum s.).
tenuiflorus (Muscari t.).
umbellatus (Ornithogalum u.).

Hyoscyamus (1903).
luridus (Anisodus l.).

Inula (1905).
aquatica (Asteriscus a.).
Buphthalmum (Buphthalmum salicifolium).
Telekia (Telekia speciosa).

Jussieua (1901).
Isnardia (Isnardia palustris).

Lamium (1903).
Molucella (Molucella laevis).
orientale (Wiedemannia o.).

Leptopyrum (1901).
generale (L. fumarioides).

Lilium (1906).
bononiense (Tulipa sylvestris).
Meleagris (Fritillaria M.).
persicum (Fritillaria imperialis).

Limodorum (1905).
generale (L. abortivum).

Lonicera (1904).
Weigela (Weigela rosea).

Lotus (1901).
purpureus (Tetragonolobus p.).

Malva 1902).
Abutilon (Sida A.).
Althaea (Althaea officinalis).
hirsuta (Althaea h.).
pallida (Althaea p.).
rhombifolia (Sida r.).
rosea (Althaea r.).
spinosa (Sida s.).

Marrubium (1903).
Ballota (Ballota alba).

Medicago (1901).
alba (Melilotus a.).
altissima (Melilotus a.).
Besseriana (Trigonella B.).
coelesyriaca (Trigonella c.).
dentata (Melilotus d.).
foenugraeca (Trigonella Foenumgraecum).
gladiata (Trigonella g.).
gracilis (Melilotus g.).
italica (Melilotus i.).
Justischmidtii (species advena).
officinalis (Melilotus o.).
parviflora (Melilotus p.).
ruthenica (Melilotus r.).
sulcata (Melilotus s.).
Trigonella (Trigonella laciniata).

Mespilus (1904).
brevispina (Crataegus b.).

Moschatellina (1904).
generalis (Adoxa Moschatellina).

Myosotis (1902).
media (M. intermedia).

Nicotiana (1903).
violacea (Petunia v.).

Nymphaea (1901).
polystigma (N. alba).

Oenothera (1901).
elegans (Clarkia e.).
pulchella (Clarkia p.).

Orchis (1905).
platanthera (Conopsidium p.).
stenanthera (Conopsidium s.).

Papaver (1902).
agreste (P. dubium).
mexicanum (Argemone m.).

Paronychia (1901).
alpina (Herniaria a.).
Herniaria (Herniaria glabra).
hirsuta (Herniaria h.).
incana (Herniaria i.).
litoralis (Corrigiola l.).

Pisum (1901).
Clymenum (Lathyrus C.).
ensifolium (Orobus e.).
flavum (Lathyrus annuus).
heterophyllum (Lathyrus h.).
hirsutum (Lathyrus h.).
inconspicuum (Lathyrus i.).
Klinggraeffianum (Lathyrus pisiformis).
Lathyrus (Lathyrus sativus).
latifolium (Lathyrus l.).
montanum (Lathyrus m.).
nigrum (Orobus n.).
luteum (Orobus l.).
Nissolium (Lathyrus N.).
odoratum (Lathyrus o.).
palustre (Lathyrus p.).
pannonicum (Lathyrus p.).
pratense (Lathyrus p.).
rubrum (Lathyrus Cicera).
silvestre (Lathyrus s.).
tuberosum (Lathyrus t.).
vernum (Lathyrus v.).

Polycarpaea (1901).
tetraphylla (Polycarpon t.).

Potentilla (1904).
moschata (Fragaria m.).
virginiana (Fragaria v.).
viridis (Fragaria v.).

Prasium (1903).
Marrubium (Marrubium vulgare).
stachydium (Stachys annua).
Stachys (Stachys recta).

Primula (1901).
arvensis (Androsace maxima).
carnea (Androsace c.).
Chamaejasme (Androsace C.).
elongata (Androsace e.).
glacialis (Androsace g.).
helvetica (Androsace h.).
obtusifolia (Androsace o.).
septentrionalis (Androsace s.).

Ranunculus (1901).
argenteus (R. aconitifolius).
Gelertii (R. Baudotii).
minimus (Myosurus m.).
thoroides (R. hybridus).
truncatus (Batrachium t.).

Rapunculus (1904).
albidus (Phyteuma spicatum).
linifolius (Campanula l.).
redivivus (Campanula rapunculoides).

Rhododendron (1901).
procumbens (Azalea p.).

Rubus (1904).
aestivus (sp. aggreg.).

Sanicula (1904).
Astrantia (Astrantia major).
bavarica (Astrantia b.).
Epipactis (Astrantia E.).

Scheuchzeria (1905).
generalis (S. palustris).

Sedum (1902).
arachnoideum (Sempervivum a.).
Bulliardi (Bulliarda aquatica).
montanum (Sempervivum m.).
sibiricum (S. hybridum).
soboliferum (Sempervivum s.).
Tillaei (Tillaea muscosa).

Selinum (1904).
agriangelica (Angelica sylvestris).
alpinum (Heracleum a.).
ammoides (Ammi majus).
Anisum (Pimpinella A.).
Anthriscus (Tordylium A.).
aquilegifolium (Laserpitium a.).
aromaticum (Chaerophyllum a.).
Athamanta (Seseli A.).
aureum (Chaerophyllum a.).
austriacum (Heracleum a.).
Balansae (Scandix B.).
Berula (Berula angustifolia).
brevicaule (Bupleurum b.).
Bulbocastanum (Bunium B.).
bulbosum (Chaerophyllum b.).
Bupleurum (Bupleurum falcatum).
Carvi (Carum C.).
Casparyi (Heracleum sibiricum).
Cerefolium (Scandix C.).
Cicutaria (Chaerophyllum sylvestre).
coloratum (Seseli c.).
conioides (Phellandrium c.).
Conium (Conium maculatum).
copticum (Ammi c.).
Coriandrum (Coriandrum sativum).
creticum (Pimpinella c.).
croceum (Bupleurum c.).
Cuminum (Cuminum Cyminum).
Cynapium (Aethusa C.).
Dioscoridis (Smyrnium D.).
elegans (Chaerophyllum e.).

Falcaria (Sium F.).
filicaule (Bupleurum f.).
Fischeri (Ligusticum F.).
fistulosum (Œnanthe f.).
Foeniculum (Anethum F.).
graveolens (Apium g.).
Hippomarathrum (Seseli H.).
Hoffmanni (Trinia H.).
ibericum (Scandix i.).
inundatum (Sison i.).
janotta (Bunium majus).
juncoides (Bupleurum nodiflorum).
Kochii (Chaerophyllum hirsutum).
Lachenalii (Œnanthe L.).
leptophyllum (Pimpinella l.).
Levisticum (Ligusticum L.).
Libanotis (Athamanta L.).
longifoliun (Bupleurum l.).
Meum (Anthamanta M.).
multicaule (Seseli m.).
Mutellina (Phellandrium M.).
Myrrhis (Myrrhis Odorata).
nitidum (Chaerophyllum n.).
nodiflorum (Sium n.).
opacum (Pastinaca o.).
Ostericum (Ostericum palustre).
Pecten (Scandix Pecten-Veneris).
Perfoliatum (Bupleurum p.).
Petroselinum (Apium P.).
Phellandrium (Ligusticum P.).
Pimpinella(Pimpinella Saxifraga).
pimpinelloides (Pimpinella magna).
Pleurospermum (Pleurospermum austriacum).
Podagraria (Aegopodium P.).
Pollichii (Oenanthe P.).
protractum (Bupleurum p.).
ranunculoides (Bupleurum r.).
repens (Sium r.).
Silaus (Peucedanum S.).
simplex (Laserpitium s.).
Sisarum (Sium S.).
Sium (Sium latifolium).
Sphondylium (Heracleum S.).
spinosum (Echinophora s.).
temulum (Chaerophyllum t.).
tenuissimum (Bupleurum t.).
tordyliastrum (Tordylium maximum).
Torilis (Tordylium Anthriscus).
Trinia (Trinia glauca).
venosum (Cnidium v.).
verticillatum (Sison v.).
Villarsii (Chaerophyllum V.).
virosum (Cicuta v.).
Visnaga (Daucus V.).
Wilhelmsii (Heracleum W.).

Senecio (1905).
Arnica (Arnica montana).
austriacus (Doronicum a.).
Columnae (Doronicum C.).
pardalianches (Doronicum p.).
plantagineus (Doronicum p.).

Silene (1901).
agricola (S. gallica).
alba (Lychnis a.).
alsinoides (Gypsophila a.).
arenaria (Dianthus a.).
barbata (Dianthus b.).
caesia (Dianthus c.).
Carthusianorum (Dianthus C.).
caryophylla (Dianthus C.).
chalcedonica (Lychnis c.).
cuculi (Lychnis Flos-cuculi).
deltoides (Dianthus d.).
elegans (Gypsophila e.).
fastigiata (Gypsophila f.).
fulgens (Lychnis f.).
Githago (Agrostemma G.).
Jovis (Lychnis Flos-Jovis).
macrocarpa (Lychnis m.).
muralis (Gypsophila m.).
ocymoides (Saponaria o.).
paniculata (Gypsophila p.).
plumaria (Dianthus p.).
prolifera (Dianthus p.).
repens (Gypsophila r.).
rubra (Lychnis r.).
Seguierii (Dianthus S.).
silvestris (Dianthus s.).
superba (Dianthus s.).
Tunica (Tunica Saxifraga).
Vaccaria (Saponaria V.).
vaga (Dianthus Armeria).

Solanum (1903).
Justischmidtii (species advena).

Specularia (1904).
conferta (Prismatocarpus c.).

Spergula (1901).
echinosperma (Spergularia e.).
fallax (Spergularia f.).

Stachys (1903).
bicolor (Hesiodia b.).
remota (Sideritis r.).
romana (Sideritis r.).

Stratiotes (1905).
generalis (S. aloïdes).

Telmatophace (1906).
generalis (Lemna gibba).

Thladiantha (1904).
sparsiflora (T. dubia).

Thymus (1903).
Clinopodium (Calamintha C.).
cunila (Satureia hortensis).
Horminum (Horminum pyrenaicum).
Hyssopus (Hyssopus officinalis).
Melissa (Melissa officinalis).

Trifolium (1901).
dalmatinum (T. dalmaticum).

Trollius (1901).
paluster (Caltha p.).

Tussilago (1905).
generalis (T. Farfara).

Vaccinium (1901).
idaeum (V. Vitis-Idaea).

Vicia (1901).
arietina (Cicer a.).
tollenda (V. hybrida).

Viola (1902).
ammotropha (V. tricolor, var. a.).

Zannichellia (1905).
maritima (Z. pedicellata).

Zinnia (1905).
laevis (Helianthus l.).

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## XII.—MISCELLANEOUS NOTES.

Mr. Cecil Victor Boley Marquand, M.A., F.L.S. has been appointed by the Minister of Agriculture and Fisheries an Assistant (Herbarium) in the Royal Botanic Gardens, Kew.

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Mr. T. G. Mason, B.A., late Economic Botanist, Imperial Department of Agriculture, West Indies, (*K.B.*, 1920, 218) has been appointed by the Secretary of State for the Colonies, Senior Botanist, Agricultural Department, Nigeria.

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**The Flora of Madras.***—The fifth part of Mr. Gamble's Flora of the Presidency of Madras, which has just been published, completes the family Ebenaceae begun in Part IV, and continues through the next eleven families as far as the genus Ilysanthes of Scrophulariaceae. The remainder of this last family is held over to Part VI. Several new varieties are described and the following new combinations for species adopted :—Linociera zeylanica (= L. purpurea Vahl.); Rejoua dichotoma (= Tabernaemontana dichotoma Roxb.); Brachystelma brevitubulatum (= Ceropegia brevitubulata Bedd., Brachystelma Beddomei Hook. f.); Cordia evolutior (= C. fulvosa C. B. Clarke with var. evolutior, not of Wight.); Torenia travancorica (= T. asiatica Hook.f.).

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* Flora of the Presidency of Madras, by J. S. Gamble. Part IV. Published under the authority of the Secretary of State for India in Council. London: Adlard & Son & West Newman Ltd., 1923. Pp. 769–962. Price 10*s*., or 6 rupees 8 a. net.

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PLATE II.

FIG. 1.

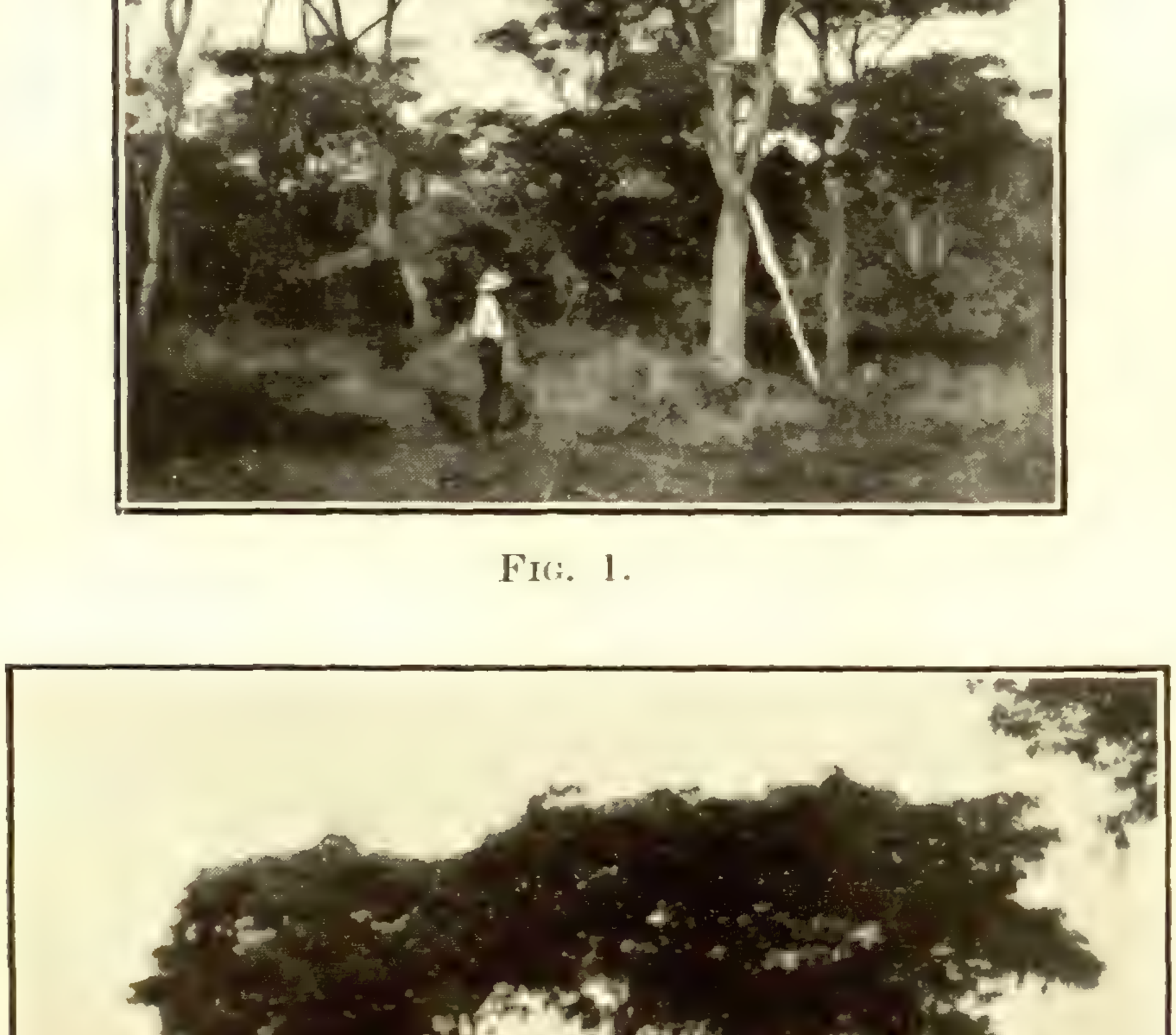

FIG. 2.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4] [1923

## XIII.—A REVISION OF BRACHYSTEGIA.

J. Burtt Davy and J. Hutchinson.

In the Flora of Tropical Africa (1871) only three species of *Brachystegia* were described. Since then the great increase in our knowledge of the botany of Central Africa, especially of Rhodesia, Nyasaland and the Congo, has brought to light a large amount of additional material. This is particularly well shown in the case of *Brachystegia*, of which there are enumerated fifty-four species in the present revision; seventeen of these are described here for the first time.

The economic importance of this genus is indicated in the following notes made by one of us on a visit to Rhodesia and the Belgian Congo in 1919. Owing to the unsatisfactory state of the genus as represented in herbaria, it was found impossible to name the species correctly without making a complete revision. For this purpose we have had the privilege of examining the types from the herbaria in Berlin, Brussels, Upsala and the Natural History Museum, S. Kensington. We are much indebted to the Directors of these institutions for their kindness in lending us these specimens, without which the task would have been impossible.

*Distribution.*—The genus *Brachystegia* is confined to equatorial Africa, none of the species being known to occur north of 10° N. lat. or south of the Tropic of Capricorn (unless possibly an odd species occurs a little south of Inhambane, in Portuguese East Africa). It is of interest to find that the species extend

### Explanation of Plate II.

Fig. 1. MooTawndu, (*Brachystegia sp. ?*) *Burtt Davy* 17897. Photograph by Mr. Burtt Davy, near Luishisi Copper Mines, Belgian Congo, Aug. 1919.

Fig. 2. MooSaamba, (*Brachystegia filiformis ?*). A tree left standing from the original forest beside the main road leading to the Governor-General's Residence, Elisabethville, Belgian Congo. Photograph by Mr. Burtt Davy, Aug. 1919.

*x* 19837 Wt 396–P 32 1000 5/23 E &

A

so much farther south of the Equator than north of it. Only nine of the fifty-four species are known to occur north of the Equator, five of them being confined to that area.

The species are mainly restricted in distribution to the dry Savannah Forest of the Great Central Plateau; only a few (possibly ten) are found in the coastal rain-forest area below 600 ft. elevation. The majority (80 per cent.) occur on the great plateau lying between Angola and Nyasaland.

Of the 54 species known, 34 are endemic in a single State, 13 in two States, and 3 in three States, leaving only four species (*B. Woodiana*, *B. utilis*, *B. apertifolia* and *B. Randii*) widely distributed.

The distribution and endemism by States is shown in the following table :—

| | Number of species. | Endemics. |
|---|---|---|
| Kenya Colony - - - - | 2 | 1 |
| Uganda Protectorate - - - | 1 | 0 |
| Tanganyika Territory - - - | 16 | 10 |
| Nyasaland Protectorate - - - | 9 | 3 |
| Portuguese E. Africa - - - | 7 | 1 |
| Rhodesia - - - - - | 17 | 4 |
| Angola - - - - - - | 10 | 6 |
| Belgian Congo (Katanga Province) | 18 | 6 |
| Upper Guinea - - - - | 6 | 5 |
| | | 36 |

*Habit.*—All the species of *Brachystegia* are trees with fibrous bark sometimes containing tannin; in this respect they contrast sharply with the allied genus *Cryptosepalum*, which is always an undershrub with annual shoots from a woody rootstock.

*Leaves.*—The leaves are always alternate and paripinnate; the leaflets vary greatly in number, ranging from about 60 pairs (*B. microphylla*) to 2 pairs (*B. Gairdnerae*, page 142, fig. 11). It is of interest to note that the latter extreme reduction is accompanied by the entire suppression of the sepals; *B. Gairdnerae* is apparently the most reduced example of the genus. Useful specific characters are derived from the position of the midrib, which is almost marginal in some species (*B. taxifolia*, etc.). The leaflets are always opposite except in *B. filiformis*, where they are rarely subopposite, and in *B. Klainei* (page 142, fig. 4), in which the lower are quite alternate and the terminal opposite. So far as is known the leaflets are sensitive and they are often closely imbricate when specimens are gathered.

*Stipules and Stipels.*—The stipules furnish a useful character for the subdivision of the genus; in the majority of the species they are very early deciduous and are not present at the time of flowering. In about 10 species, however, they are more or loss persistent and have a broad foliaceous base with a long

terminal appendage (*see* page 142, figs 8, 10, 12). In several species the leaf-rhachis is more or less enlarged below the insertion of the leaflets sometimes forming wings or definite stipel-like appendages.

*Inflorescence.*—This is always terminal and either a panicle or a spiciform raceme; the bracts are usually caducous.

*Bracteoles.*—Constantly two in number, and are like a 2-lipped valvate calyx, in which respect they closely resemble those in the allied genus *Berlinia*. *Calyx.*—Composed of usually 5 free and often very minute ciliate sepals, sometimes reduced to one or none (*B. Gairdnerae* and *B. Bakeriana*). *Petals.*—Entirely wanting or represented by very small scale-like bodies (*B. spicaeformis*). The absence of petals distinguishes the genus from *Berlinia*, from which *Brachystegia* would appear to be derived. *Stamens.*—United at the base only or into a fairly long tube. *Ovary.*—Usually stipitate, rarely sessile, hirsute as far as known; ovules few. *Legume.*—Woody, oblong, truncate at the apex, opening with some force, the valves twisting in the process. *Seeds.*—Much-compressed, hard, more or less orbicular.

## The Economic Value of the Brachystegias.

The great central plateau of southern tropical Africa is mainly covered with shadeless dry Savannah Forest, composed largely of leguminose trees. Among these the Brachystegias occupy a prominent place; indeed they form such characteristic, and in places dominant, features of the forest over thousands of square miles of country extending from the Limpopo-Zambesi Watershed to the Katanga Plateau at the head-waters of the Congo River, and from Nyasaland to the Angolan Highlands, that this plant-formation may well be termed "Brachystegia Forest." The general features of this type of Savannah Forest are indicated in the photograph reproduced on Plate II, fig. 1.

The several species of *Brachystegia* are more or less gregarious, one or other being the most common tree in particular localities. In Portuguese East Africa, also, Sim(1) notes that there is in many places an almost pure forest of one species (probably *B. Bragaei*) of which "the re-growth is excellent" and the tree is inclined to monopolize suitable districts. In the mChopes country, where extensive cultivation was abandoned about 1877, there was in 1909 a dense forest of seedling Brachystegias, 6 to 8 m. high, and 15 cm. in diameter, ready for the first thinning.

The quantity of forest products available over such a vast area of country, and where the species are so plentiful, is enormous, and this fact so impressed the traveller in Rhodesia and the Katanga Province, that extensive enquiries were made as to the possible application of these resources to industrial purposes. The information gained from various sources shows the existence of a hitherto unsuspected supply of valuable products awaiting exploitation.

*Uses of the bark*.—Among the natives of Central Africa, the bark is the most useful product of the *Brachystegia* tree, and serves them for an extraordinary number of purposes; in fact, certain species appear to be almost essential to their existence in the present state of native economy.

Sim([1]) considers that the utilization of *Brachystegia* bark in Portuguese E. Africa "is a forest problem of equal importance with the utilization of all the timber in the Province, and well deserves skilled management, and may some day bring a large revenue."

In 1907 enquiries from the United States were received as to the occurrence and use of Brachystegia bark-cloth in the Transvaal and adjacent territories; these suggested a possible commercial value for the article if obtainable in quantity and at a reasonable price. A note published in the Transvaal Agricultural Journal([2]) called attention to the matter and asked for further information. In December 1908, the following unsigned letter was received in response :—"In your 'Journal' for Jan. of 1907 which has just come into my possession I noticed some remarks therein *re* 'Brachystegia barkcloth'; the description and bark leads me to think that I have an enormous quantity of a very similar tree on this farm, so I am taking the liberty of sending you 3 (three) different kinds of bark taken from trees here, one or more of which may be suitable for the requirements of your American enquirer. These barks are used extensively by both natives and farmers for building purposes; the natives also utilize it for weaving into grain sacks and game nets. When damp it becomes quite pliable and very strong, but very brittle when dry. The natives chew the bark before using it for the manufacture of game nets and snares. The sample marked 'Makevuti' is considered the strongest. 'M'donde' comes next, and 'M'Sassa' third."—(Unsigned), Glen Avon, Salisbury, December 7th, 1908.—The specimens of bark never arrived, and the name of the correspondent was not traced.

A letter was also received from Mr. Tom Oxden-Willows, who wrote that he had seen the tree, as described in the Journal, in the Melsetter District of Rhodesia; the kind known as "M'Tonda" (*B. edulis ?*) existing in very large quantities between Umtali and Melsetter, where it had been cut for telegraph poles.

The Native Commissioner, Melsetter, kindly supplied the following information about three kinds of Bark-cloth trees :—

1. A tree called "Muwuzhe" which grows to about 30 feet in height. Bark smooth and of a light grey colour. Leaves are in pairs on the stalk and are about $1\frac{1}{2}$ inches long, and about $\frac{1}{2}$ inch wide and of a dull green. Trees found at an altitude of about 2,500 to 3,000 feet, in large numbers.

2. A tree called "Mufuti" (probably *B. Boehmii* or *B. filiformis*) grows to about 20 feet in height, has a rather rough bark of a dark grey colour and leaves very similar to the "Muwuzhe." It is found in great numbers at an altitude of 2,500 to 3,000 feet.

3. "Musaasa" (probably *B. Randii*) is by far the most common of the bark trees and is found all over Southern Rhodesia at an altitude of from 3,000 to 6,000 feet. It grows to 30 or 40 feet in height, has a rough outer bark in the large trees but almost smooth in the young trees. The leaves are bright green when mature, but in the early Spring they are of a great variety of beautiful colours in red and pink. They are arranged in pairs on the stalk like those of the preceding trees and are about $2\frac{1}{2} \times \frac{5}{8}$ inches in size.

The trunks of the "Musaasa" vary in diameter from 8 to 24 inches. The "Muwuzhe" trunks are about the same size, but the "Mufuti" are seldom more than 12 inches in diameter.

The "Muwuzhe" and "Mufuti" barks are used for making game nets, fishing lines, bags, and blankets. That of "Musaasa" being much inferior is principally used for making blankets and sacks, it is not strong enough for nets and game traps. As far as is known this is not an article of commerce in the country, hence no market price can be given.

*Tan-bark.*—The bark of one of the mooSaambas (*B. tamarindoides* or *B. utilis*) is used in the Katanga for tanning hides. A sample was secured which has been examined at the Imperial Institute, through the courtesy of Professor Wyndham R. Dunstan, F.R.S. It was found to contain only 6·6% of tannin, too small a quantity to make it of commercial interest in Europe in competition with materials of better quality. It produced, however, a pale reddish brown, soft leather, of promising quality, and there seems to be no reason why the bark should not be used locally in Rhodesia for tanning purposes. Information was received that in the Katanga the bark of a mooSaamba had been found to contain up to 30 % of tannin; probably this was a different species from the one from which the sample referred to above was obtained.

The bark of "*B. spicaeformis*" of Sim (not of Benth., probably *B. Bragaei* or *B. Randii*) of Portuguese E. Africa, is said to contain about 18 % of tannin; Sim suggests that as there is such a vast quantity of it available, the tannin might be extracted on the spot and exported, as is done in the case of the Wattle bark of Natal, with considerable profit. The seeds also which are produced in enormous quantities, and which weigh well, he thinks "will be found to contain a lot of tannin."

Speke and Grant noted that a "blood-red juice" exuded on cutting the bark of *B. Randii*, in Tanganyika Territory, and Dr. Rand notes that in Rhodesia, where the same species is very plentiful, it yields "large quantities of a gum deep red in colour and very rich in tannin, which should be of some commercial value." A gum is also obtained from *B. eurycoma* of S. Nigeria; a brown resin from *B. leonensis* of Sierra Leone, and a dyestuff (a resin?) from a species of the allied genus *Berlinia* (*B. Baumii*) of Angola.

**The bark of *B. mpalensis* of the Katanga Plateau and N.W. Rhodesia is a native remedy for coughs** (*Rogers*).

*Fibre.*—On the south Tropical African plateau the bark of certain species is the principal source of fibre for the manufacture of rope, cord, string, thread, game-nets, snares, fishing-lines, sacks, grain bags, etc. The twine is quickly prepared by rubbing between the palms of the hands. The following species have been reported as yielding bark used for cord, etc.; doubtless other species of the genus are also so used:—*B. stipulata*, *B. filiformis*, *B. Boehmii*, *B. utilis*, *B. tamarindoides*, *B. edulis*, *B. Randii*, *B. Bragaei*, and the allied *Berlinia globiflora*.

*Bark-cloth.*—Before the widespread introduction of cotton goods, the principal clothing worn by the natives of the Brachystegia Forest region was made of fibrous sheets beaten out of the bark of several species of *Brachystegia*, and *Berlinia*, and also of a species of *Ficus* (*F. natalensis*).(4) Roscoe(6)(3) states that King Semakokiro of Budu, in the western part of Uganda, who lived about 150 years ago, is said to have compelled all his people to cultivate the bark-cloth tree (*Ficus natalensis*?), and that bark-cloth became the national dress of the Baganda in the reign of King Semakulu, about 100 years ago. Semakulu made laws that each peasant should plant a number of the trees on his land, and also that every man and woman should be clothed, for till then the natives were practically naked. This was not done from any sense of decency, but because bark-cloth yielded revenue to the King. But the use of bark-cloth is now fast disappearing, Roscoe states, owing to the introduction of unbleached calico, "which is of a stronger texture, more durable, and more easily cleaned." "It is a pity," he adds, "that the bark-cloth industry, which was so extensive and so useful, should be allowed to die; if only some other use could be made of the bark-cloth, it would be an advantage to the natives, who would reap some benefit from the trees on their estates." Sim (1) notes that in the northern districts of Portuguese E. Africa, the natives make all their cloth from the bark of *B.* (*Bragaei*?) and other species of the genus *Brachystegia*.

*Preparation of Bark-cloth.*—In Angola, according to Welwitsch, the bark was boiled and "prepared" for manufacture into white sheets. Roscoe describes the making of bark-cloth as practised in Uganda when he was there, as follows:—The tree-trunk was stripped to a height of eight or ten feet according to the height at which the branches forked; where the trunk was stripped it was smeared with cow-dung and wrapped round with plaintain leaves; a new bark soon formed which after ten or twelve months was ready to be used for bark-cloth. The third and fourth barks thus obtained were the finest in quality, though the tree might yield up to eight or more barks.

The bark used is the inner, or second, bark of the tree; both barks are removed from the tree together, and the outer, which is thin, is then scraped off. The inner bark is left during the

night to dry, and any soft, pulpy substance is scraped off the inside. The worker then lays the strip of bark, which is some four to six feet long, on a log with a flattened surface, and beats it with a mallet(5) which is not unlike a stone-mason's, but has ridges cut round it, thus leaving fine lines on the bark-cloth as it is beaten. The man goes over the material with the mallet until it is beaten out to the thickness of strong brown paper, and by the time he has finished a strip of bark which was four feet long by eighteen inches wide will have become about six feet long and four feet wide. It is then spread out in the sun to dry, and the exposure to light gives the upper surface a tint somewhat like terra-cotta, while the underside is of a lighter shade. Any holes where branches have grown or any flaws in the cloth are cut into neat squares and patched with pieces taken from the edges so deftly that in a well-made bark-cloth they are not noticeable. These cloths are usually made up by the men into sheets eight feet square, two lengths being stitched together and pressed in such a manner that the seam is not seen when the cloth is being worn. For thread they use strips of fibre from the dry plantain stem. Women rarely, if ever, learn to stitch these, and the work is left to the men, for sewing is not the women's work, and it is only where there are mission schools that women are now being taught to use the needle. (*Roscoe.*[3])

Further information on the preparation of Uganda bark-cloth is given by Roscoe in his book "The Baganda."

"The trees grow readily and rapidly, and yield annual barks of good quality for some seven years; they require no cultivation." "The cost of bark-cloth lay in the labour of growing the trees, stripping them of their bark, and beating it out to the required thickness; this was, after all, trifling in a land where time is of little value." (*Roscoe.*)

In the district of Sango, in the kingdom of Budu, are said to grow trees which produce the finest kind of bark-cloth in Uganda, of a better quality and a richer colour than any other. This particular species is said not to grow freely in other places, and it is uncertain whether it is a *Brachystegia*, a *Berlinia*, or a *Ficus*. Only one species of *Brachystegia* (*B. venosa*) is known to occur in Uganda.

The following species, and perhaps others also, are known to furnish bark suitable for making cloth:—*B. Boehmii*, *B. Woodiana*, *B. Randii* and *Berlinia globiflora* of Tanganyika Territory, Nyasaland and Rhodesia; *B. longifolia* and *B. utilis* of Nyasaland; *B. Bragaei* of Rhodesia and Portuguese E. Africa, which is said to furnish exceptionally good bark-cloth; *B. edulis* of Kenya Colony, Tanganyika Territory and Rhodesia; *Berlinia Baumii* of Angola; and *Ficus natalensis* which extends from Uganda south to Natal.

*Water-baskets.*—Sim (1) states that in the sandy districts of parts of Portuguese East Africa, where water is only obtainable at distances of several miles, the water-basket is an implement

of immense utility. The basket is made by ringing the tree at two places 4 to 5 feet apart, and by "cutting down one side and removing the piece of bark intact, the two incurved sides are kept apart and in place by skewers, the ends are doubled up and the met edges sewn together at the corners, and the cross ends sewn to the skewer nearest to each," the sewing being done with fibre made from the same bark. These baskets last well and do not leak, and though the removal of the bark kills the trees, this is of little consequence as they are so abundant. "I saw water brought up out of a well 20 metres deep by means of a half-inch rope of the twisted bark of the branches; this bark is also used for hinges and whatever other purposes fibre can be used for; a piece subjected to a strain of 400 pounds did not break, though it stretched out considerably" (*Sim*).

*Other Uses of the Bark.*—The bark of *B. Allenii* of Portuguese E. Africa, of *B. tamarindoides* of Angola and the Katanga and of *B. Woodiana*, in Tanganyika Territory, is used for making native river craft.

Speke and Grant, and Welwitsch, stated that the bark of certain species (*B. Woodiana*, *B. tamarindoides* and *B. Randii*) was also made into kilts, cloths, boxes, corn-bins and huge grain-stores, baskets, mats, matches, lashings, roofing for camp-huts, etc.

Sim ([1]) states that in the northern districts of Portuguese E. Africa one species (probably *B. Bragaei*) "is perhaps the most important tree in the Province, under its present circumstances." The natives of the mChopes district "make all their water baskets, beer vessels, grain drums and cordage from its bark," and only use the bark of another tree for making bark-cloth because that of the latter is more easily prepared; throughout the Province, north of the Limpopo, they use the bark of this *Brachystegia* only, for making cradles, coffins and beehives.

*Timber.*—The timber of *B. mpalensis*—which is described as a large tree—is said to be excellent for constructive purposes (*Deschamps*). That of *B.* (*Bragaei ?*) of Portuguese E. Africa "takes part in all domestic woodwork construction," being "hard and durable" (*Sim*). That of *B. edulis* of Kenya Colony, is said by Battiscombe to be easily worked, well-marked, but not durable.

That of *B. longifolia* of Nyasaland is described by Buchanan as very soft.

The wood of one of the Portuguese E. African species (the "*B. appendiculata*" of Sim) is described as compact, of medium weight (50 lbs.), reddish-grey colour, with good surface; rings 6 mm. apart; pores scattered, very large; rays not visible (*Sim*).

In Southern Rhodesia one of the mSaasas is used for telegraph poles.

The wood of other species (e.g., *B. Woodiana*) is used for the rafters of sheds, native huts, etc. It is largely used for fuel

for running the locomotives on the railways of the Katanga, in the absence of local supplies of coal and its consequent cost.

The question of the possible utilization of these large supplies of wood, in the preparation of charcoal, wood-distillation products, and paper pulp, is worth investigation.

*Edible seeds.*—The seeds of *B. edulis* are said to be eaten by the natives of the Batoka Highlands of N.W. Rhodesia, and according to Sim, those of *B.* (*Bragaei* ?), also, are edible.

*Fodder.*—The pods of *B. Woodiana* are said to be a favourite food of elephants (*Rand*).

## General Features of the Brachystegia Forest.

The main *Brachystegia* forest occupies the northern belt of that great tract of Savannah Forest which extends from Mafeking and the Magaliesberg northward to the great Congo Basin which forms such an effective barrier to plant-migration. Broadly speaking, it is similar in aspect and general character (though not in botanical composition) to the "Bushveld" of the Transvaal, Bechuanaland and Southern Rhodesia south of the Zambesi–Limpopo watershed.

The deciduous period of the *Brachystegia* forest is very brief—perhaps not more than two or three weeks of winter (at the end of July and beginning of August). A striking feature of the forest at this period is the beautiful leaf-colouring of some species of *Brachystegia*. This varies from pale green, light green and olive green, through yellow, bronze, brown, red and scarlet to delicate shades of pink and purple. As lighted up by the afternoon sun against a background of dark green forest, the effect is extremely beautiful, and one never to be forgotten. A peculiar and interesting feature of this phenomenon is that it is the tender spring foliage which assumes these rich tints, whereas in the north temperate zone it is the autumn foliage of the oaks, maples, etc., which produces such brilliant colouring. And whereas the adult *Brachystegia* leaves are usually more or less chartaceo-coriaceous in texture, the young foliage is so thin and translucent that De Wildeman named a specimen in that early stage as variety *papyracea* of *B. Hockii*.

The *Brachystegia* forest affords but little shade despite the comparatively dense growth of trees, and the ground beneath is well covered with grass and herbaceous or suffrutescent vegetation. There is little or no bush undergrowth, except on cut-over ground. The trees are scattered at intervals of 6 to 12, 20 or 30 ft., rarely more, sometimes less, according to age and size, or the character of the soil. They are as a rule slender for their height, varying from 8 ins. to 3 ft. in diameter, occasionally attaining to 4 ft. and, rarely, even to 5 ft. Their height is usually about 50 ft., on some soils only 20 ft.; on deep rich soils the trees attain a height of 75 or 80 ft., but these larger trees usually represent other genera. The surface of the forest

as seen from above is fairly level. Much of the branching occurs at two-thirds to one-half the height from the ground, and many trees form only two, or three, primary branches; the branching is mostly at an angle of 30° to 40° so that the spread of the head is narrow in proportion to the size of the tree (*see* Plate II, fig. 1). A few large trees occur here and there which have a much more spreading habit, *e.g.*, the nGanza (*Brachystegia mimosaefolia*) and the mooSaamba makooba (*see* Plate II, fig. 2).

*Soil Requirements.*—The reproductive capacity of a tree, and its soil requirements, are important factors in its economic exploitation. Species which require very rich soil, or which are reproduced with difficulty, cannot be utilized with profit unless the products obtained are of high commercial value. But given the opposite conditions, even cheap products may be handled profitably. Several of the Brachystegias are found occupying thin shaley and quartzite soils, so shallow or so poor in supplies of plant food that many other forest trees of the same Phyto-geographical Region fail to grow there. This is so marked a feature of some species of this genus, that local residents of Rhodesia and the Katanga are able to say that where certain Brachystegias are gregarious, the soils are very poor and unfit for agriculture. This may not apply to all the species, but it is noteworthy that on the strips of deeper and richer soil along the stream banks, Brachystegias are largely replaced by trees of other genera.

*Seed Dispersal.*—*Brachystegia* pods are woody and very rigid. When ripe, these pods open with explosive violence, under changes of temperature, each valve of the pod twisting corkscrew fashion with such force that the seeds are shot out. The twisted valves are so rigid that any force applied in an attempt to straighten them out results in the valve breaking into sections.

The seeds are large, flat, hard and shining, and during the fruiting season can be picked up in quantity beneath the trees. The dense growth of seedling Brachystegias on abandoned agricultural land in Portuguese E. Africa, has already been referred to. Coppicing from the stumps of cut-over *Brachystegia* forest is very noticeable in the Katanga Province of the Belgian Congo.

That Brachystegias will thrive on comparatively thin and poor soils, that seed is readily obtainable, and that the trees reproduce freely from seed and by coppicing, are important economic factors in the problem of afforestation of tropical soils of poor quality.

## Vernacular Names.

There is some confusion in the application of native names to the trees of the Katanga Province, due to the number of native tribes and languages there brought together from different parts of Central Africa for the development of the copper-mining industry.

Sometimes the same name is used for the same tree by more than one tribe, but in some cases each tribe has a different name for the same tree. In other cases, however, the same name is applied to different species of the same or of allied genera, thus producing great confusion in tree nomenclature. The following native names, used in the Katanga, were carefully identified with the specimens, and checked, and in some cases re-checked, by questioning different natives at different times. It was interesting to note how keen the natives were, in certain cases, to discriminate between allied species some of which bore a close superficial resemblance; in other cases they would "lump" species under one vernacular name, possibly because the particular tree was equally useful (or useless) from their particular point of view.

In the following list the language or country in which the vernacular name is used follows in brackets after the name; the collector is responsible for identifying the vernacular name with his specimen, and his name appears in brackets after the specific name; for the specific names attached to the specimens, we alone are responsible; where these were not seen the probable species (based on the geographical distribution and other available information) has been assigned with a query. It is unfortunate that the name mooSaamba or mooZamba is promiscuously assigned to several of the multifoliate species with resulting confusion as to specific identity, as some of them are of particular economic value. The prefix moo (i.e., tree?) often spelt mu, has the long oo sound, and consequently the phonetic rendering has here been adopted.

Akolodo (Yoruba) = *B. eurycoma* (Millson)
amaChibero (Mashona) = *B. filiformis* (Swynnerton)
Bodgei (Sierra Leone) = *B. leonensis* (Lane-Poole)
Kapootoo (Chindao, Kibembe) = *B. Hockii* (Verdick?), *B. mpalensis* (Rogers), *B. spicaeformis* (Burtt Davy)
Kasosolwa (Katanga); has been referred to *Brachystegia*, but the material is incomplete (Ringoet 32)
Kisamba-Kwe-Kwe (Katanga) = *B. katangensis* (Verdick)
Lamba, or Samba? (Angola) = *B. Gossweileri* (Gossweiler)
mBombo (Chilundi) = *B. filiformis* (Rogers)
mChenga (Tanganyika Terr. & Mlanje) = *B. Randii* (Speke & Grant, Purves)
mDonde (Glen Avon, near Salisbury, S. Rhodesia); specimens not seen.
mJombo (Mlanje) = *B. Boehmii* (Purves); see also nJombo
mNenga (Tanganyika Terr.) = *B. Randii* (Speke & Grant)
mNondo (Rhodesia) = *Berlinia globiflora* (Eyles, Monro)
mPutchi (Chilunda) = *B. mpalensis* (Rogers)
mPootu (Katanga) = *B. spicaeformis* (Ringoet)
mRihi (Kidyo) = *B. edulis* (Battiscombe)
mRiti (Suswahili) = *B. edulis* (Battiscombe)
mSaasa or mSassa (Mashona) = *B. Randii* (Rand, Eyles); *Berlinia globiflora* (Marshall); see also mooSaasa

mTagata (Echuabo of Quelimane) = *B. microphylla* ? (Sim)
mTamba (Landin & Butonga) = *B. Bragaei* ? (Sim)
mTete (Angola) = *B. obliqua* (Gossweiler); see also mooTete
mTonda (Mashona) = *B. edulis* ? (Tom Oxden Willows; specimens not seen)
Macarara (Suahili of Magenja da Costa) = *B. Bragaei* ? (Sim)
Machabel (Mashona) = *B. Woodiana* (Rand)
Malevooti (Salisbury District); specimens not seen
Mapootoo (Chikaundi) = *B. mpalensis* (Rogers); see also Kapootoo
Marotta (Echuabo of Quelimane) = *B. Bragaei* ? (Sim)
Mecombo (Tanganyika Terr.) = *B. Woodiana* (Speke & Grant)
Messina (Echuabo of Quelimane) = *B. pectinata* (Sim)
Mondi (Echuabo of Quelimane) = *B. Woodiana* (Sim)
moTondo (Batoka Highlands) = *B. edulis* (Kirk); *Berlinia globiflora* (Swynnerton); see also muTawndu and mTonda
mooAngombe (Angola) = *B. Bakeriana* (Gossweiler)
mooBanda (Angola) = *B. spicaeformis* (Gossweiler); but mooBanga is an *Afrormosia*, in the Katanga
mooFooti (Mashona) = *B. filiformis?* (specimens not seen); but mooFootoo is a *Vitex* sp., in the Katanga.
mooKootoo (Katanga) = *B. Hockii* (Verdick)
mooPanda or mooPondo (Angola) = *B. spicaeformis* (Welwitsch) and *Isoberlinia* sp. (Dawe)
mooSaamba kiloko, i.e. little, (Katanga) = *B. tamarindoides* (Burtt Davy)
mooSaamba makooba, i.e. big, (Katanga) = *B. filiformis* (Burtt Davy)
mooSaamba (Katanga) = *B. utilis* (Burtt Davy); see also mooZamba, mooSamba and Samba
mooSaasa (Melsetter District) = *B. Randii* ? (Native Commissioner); specimens not seen; see also mooTsatsa; in the Katanga Province the same mooSaasa is applied to an *Albizzia* (Burtt Davy 17817)
mooSamba (Chikaundi and Chinyanga) = *B. filiformis* (Rogers); see also mooSaamba
mooShobi (Angola) = *B. Bakeriana* (Gossweiler)
mooShovi (Angola) = *B. Hockii* (Gossweiler)
mooTagata (Echuabo of Quelimane) = *B. microphylla ?* (Sim)
mooTawndoo (Katanga) has been referred to *Brachystegia* but the material is incomplete; may be a *Berlinia* or *Isoberlinia*; see also Tondo
mooTsaka (Gazaland) = *B. edulis* (Swynnerton).
mooTsatsa (Gazaland) = *B. Bragaei* (Swynnerton); see also mooSaasa
mooTete (Angola) = *B. Bakeriana* (Gossweiler); see also mTete
mooWuzhe (Melsetter District) = *Ficus* sp.? (Native Commissioner); specimens not seen
mooZamba (Angola) = *B. apertifolia* ? (Welwitsch); see also mooSamba

Mumbu (KotaKota) = *B. filiformis* (Rogers)
Munzi (Chindao) = *B. Fischeri?* (Swynnerton)
nGanza (Katanga) = *B. mimosaefolia* (Burtt Davy)
nGuanzo (Tanganyika Terr.) = *B. Goetzei* (Goetze)
nJombo (Shire Highlands) = *B. longifolia* (Buchanan); see also mJombo
Nangwesu (Mlanje) = *B. utilis* (Purves)
Panda verdadeira, i.e. genuine Panda, (Angola) = *B. spicaeformis* (Welwitsch)
Samba or Saamba (Angola) = *B. Bequaertii, B. puberula* and *B. Gossweileri ?* (Gossweiler); see also mooSaamba
Sandwe (Katanga) = *B. stipulata* (Verdick)
Tondo (Shangaan and mChopes) = *B. Bragaei ?* (Sim); see also mooTawndoo
Tzontzo (Portuguese E. Africa) = *B. Bragaei ?* (Sim)
umBfooti (Chindao) = *B. Boehmii* (Swynnerton), and *B. filiformis* (Swynnerton); see also mooFooti

## Key to the Species.

Section 1. Stipulatae. Stipules with a large foliaceous base and linear appendage, more or less persistent during flowering (*see* page 142, figs. 8, 10, 12).

Leaf-rachis and leaflets glabrous :
- Base of stipules more or less reniform :
  - Sepals tomentose, about 1·5 cm. long; leaflets oblong-elliptic, 3–4 cm. broad; stipules 1·5–2 cm. broad ..... 1. **lufirensis.**
  - Sepals glabrous except the margin, striately ribbed; leaflets 1–2 cm. broad :
    - Calyx about 1·5 cm. long; leaflets narrowly oblong-elliptic; stipules about 1·5 cm. broad 2. **stipulata.**
    - Calyx about 0·5 cm. long; leaflets elongate-oblong; stipules about 0·7 cm. broad ... 3. **Holtzii.**
- Base of stipules obliquely oblong-lanceolate, 1·5–2 cm. long; appendage linear; leaflets lanceolate, about 2·3 cm. broad (*see* page 142, fig. 8) ..... 4. **Taubertiana.**

Leaf rachis and leaflets hairy :
- *Appendages of the stipules filiform or narrowly linear :
  - Leaflets about 5–7 pairs, about 3 cm. broad, softly pubescent

Fig. 1. *B. Wangermeeana* × $\frac{1}{8}$. Fig. 1a. leaflet of same, natural size. Fig. 2. *B. venosa* × $\frac{1}{2}$. Fig. 3. *B. reticulata*, natural size. Fig. 3a. leaflet of same, × 2. Fig. 4. *B. Klainei* × $\frac{1}{2}$. Fig. 5. *B. Randii*, showing rhachis winged below the leaflets, and developing into stipels; natural size. Fig. 6. *B. Lujae* × $\frac{1}{2}$. Fig. 7. *B. Hockii* × $\frac{1}{2}$. Fig. 8. *B. Taubertiana*, leaflet × $1\frac{3}{4}$. Fig. 9. *B. appendiculata*, terminal leaflet × $\frac{1}{2}$. Fig. 10. *B. Woodiana*, stipule × $1\frac{1}{2}$. Fig. 11. *B. Gairdnerae*, natural size. Fig. 12. *B. velutina*, × $\frac{1}{3}$. Fig. 13. *B. apertifolia*, leaflet × $\frac{1}{2}$.

beneath; stipules pubescent all over, with linear appendages; stipels absent (*see* page, 142, fig. 12)..... 5. **velutina.**

Leaflets about 12–25 pairs, less than 2 cm. broad:

Calyx about 1·5 cm. long; leaflets densely and softly tomentose beneath; stipels absent ..... 6. **Bequaertii.**

Calyx (where known) below 1 cm. long; leaflets rather sparingly pubescent beneath (tomentose in *B. Boehmii*):

Stipels present and conspicuous below the leaflets, the latter about 1·5 cm. broad, rounded or obtuse ..... 7. **Goetzei.**

Stipels absent:

Stipules glabrous; leaflets 1·5 cm. broad or more, emarginate, usually glabrous or subglabrous above except the midrib and margin ..... 8. **filiformis.**

Stipules pubescent or tomentose; leaflets about 1 cm. broad, acute or obtuse, more or less tomentose on both surfaces ..... 9. **Boehmii.**

**Appendages of the stipules broadly linear-falcate, foliaceous, nearly as long as the internode; stipels absent; leaflets slightly pubescent, emarginate or rounded, about 1·5 cm. broad (*see* page 142, fig. 10).... 10. **Woodiana.**

Section II. CADUCAE. Stipules deciduous before flowering or if slightly persistent then without a foliaceous base, but sometimes long and linear.

*Inflorescence branched:

†Leaflets 10 or more pairs:

‡Leaflets contiguous or with overlapping margins (*see* also *B. puberula*):—

§Leaflets over 4 mm. broad:

Midrib almost medial; leaflets

glaucous and finely reticulate below, 8–14 mm. long :
Calyx almost glabrous; leaflets glabrous; Congo and Rhodesia ..... 11. **glaucescens.**

Calyx distinctly velvety; leaflets minutely appressed pubescent; Angola ... 12. **Gossweileri.**

Midrib more or less near the margin; leaflets about 2·5 cm. long :
Inflorescence with about 8 lateral branchlets; leaflets about 10 pairs, glabrous ..... 13. **katangensis.**

Inflorescence mostly only slightly and shortly branched; leaflets 15–20 pairs, more or less pubescent :
Inflorescence with several spreading lateral branches, leaflets pubescent on both surfaces, mostly over 3 cm. long; midrib almost central; Tanganyika ..... 14. **flagristipulata.**

Inflorescence dense with few branches; leaflets under 3 cm. long; midrib towards the margin :
Leaflets almost 1 cm. broad, finely reticulate :
Leaflets broadest across the base, lanceolate and conspicuously narrowed to the obtuse apex (*see* page 142, fig. 1) ..... 15. **Wangermeeana.**

Leaflets broadest about the middle, more or less oblong, rounded at the apex ..... 16. **Wildemaniana.**

Leaflets 4–6 mm. broad, obtusely reticulate .... 17. **tamarindoides.**

§§Leaflets not more than 2 mm. broad :

Midrib central or nearly so, prominent below ; Tanganyika ..... 18. **microphylla.**

Midrib near the margin, prominent below ; Tanganyika 19. **taxifolia.**

Midrib quite inconspicuous, impressed below, sometimes slightly visible above ; Katanga and N.W. Rhodesia ..... 20. **mimosaefolia.**

Here also comes the imperfectly described species ..... 21. **pectinata.**

‡‡Leaflets not contiguous, usually remote from one another ; midrib more or less central :

Leaf-rhachis glabrous ; leaflets lanceolate, 4–8 cm. long, glabrous ..... 22. **longifolia.**

Leaf-rhachis pubescent :

Leaflets about 4 mm. broad :

Leaflets subequally cordate at the base ; Rhodesia and Portuguese E.Africa (*see* page 142, fig. 3) ..... 23. **reticulata.**

Leaflets rounded only on one side, very oblique on the other ; Tanganyika 24. **Fischeri.**

Leaflets about 1 cm. broad :

Leaf - rhachis distinctly pubescent ; leaflets laxly arranged :

Leaflets rounded and semicordate at the base, averaging about 4·5 cm. long (*see* page 142, fig. 13) ..... 25. **apertifolia.**

Leaflets narrowed on one side at the base, averaging about 3 cm. long :

Leaflets downy below, shortly pubescent to glabrescent on the margin ; bracteoles tomentellous ..... 26. **utilis.**

Leaflets pilose below with appressed hairs, and with bracteoles pilose ciliate on the margin ..... 26. **Mildbraedii.**

Leaf-rhachis minutely puberulous; leaflets almost contiguous ..... 28. **puberula.**

††Leaflets 8 pairs, oblong-lanceolate, about 7–8 cm. long; flowers in a dense panicle; calyx fulvous-tomentose; rhachis of leaf thinly pilose; Sierra Leone ..... 29. **leonensis.**

†††Leaflets 4–6 pairs; flowers in a lax panicle; S. Central and East Africa:

Leaflets oblong, rounded and conspiculously emarginate at the apex ..... 30. **Allenii.**

Leaflets oblong or ovate-lanceolate, narrowed to the apex:

Inflorescence glabrous; leaflets broadest towards the base, glabrous, about 5 cm. long, with very prominent nerves above, rounded at the apex... 31. **glaberrima.**

Inflorescence puberulous or pubescent:

Leaflets oblong-lanceolate, broadest towards the middle ..... 32. **angustistipulata.**

Leaflets ovate-lanceolate, broadest towards the base:

Leaflets glabrous, about 7–9 cm. long, obtusely pointed; calyx 7–8 cm. long ..... 33. **polyantha.**

Leaflets minutely puberulous towards the midrib, under 6 cm. long, emarginate; calyx about 5 mm. long or less ..... 34. **Bussei.**

††††Leaflets about 2–4 pairs (mainly West Africa):

‡Leaflets opposite, rounded, obtuse or slightly acuminate at the apex; inflorescence rather

dense - flowered; pedicels short :

Peduncle hairy :

Leaflets distinctly petiolulate, obliquely elliptic, acuminate, with few lateral nerves, shining; inflorescence borne on the young shoots, rusty-tomentellous; Cameroons 35. **cynometroides.**

Leaflets sessile :

Leaflets oblong - elliptic, rounded at the apex; inflorescence on the current season's growth, velvety - tomentose; Upper Guinea ..... 36. **eurycoma.**

Leaflets ovate - lanceolate, emarginate, minutely puberulous towards the midrib; inflorescence puberulous; Tanganyika 34. **Bussei.**

Leaflets more or less ovate, narrowed to the apex; inflorescence on the previous season's growth, rusty tomentose; Nyasaland ..... 37. **floribunda.**

Peduncle glabrous; inflorescence borne on the young shoots; leaflets sessile, falcately lanceolate or elliptic-lanceolate, obtuse, with numerous lateral nerves, shining; Cameroons ..... 38. **Zenkeri.**

‡‡Leaflets mostly alternate, long-acuminate, shining; inflorescence lax; pedicels long; Gaboon (*see* page 142, fig. 4) ... 39. **Klainei.**

**Inflorescence spiciform, unbranched or rarely with a short branch at the base :

†Bracteoles glabrous except the puberulous margin or rarely minutely and sparsely puberulous :

‡Leaf-rhachis or axis of inflorescence puberulous or pubescent :

Uppermost pair of leaflets oblong-lanceolate, about 6–8 cm. long, obtusely pointed :
Uppermost pair of leaflets about 3 times as long as the lowermost pair, distinctly acuminate with about 10 pairs of lateral nerves; inflorescence about 5 cm. long (*see* page 142, fig. 6) 40. **Lujae.**
Uppermost pair of leaflets about 2 times as long as the lowermost pair, emarginate, with about 6 pairs of lateral nerves; inflorescence under 3 cm. long (*see* page 142, fig. 2)..... 41. **venosa.**
Uppermost pair of leaflets obliquely obovate-elliptic, rounded and emarginate at the apex :
Uppermost pair of leaflets less than 4 cm. long; inflorescence about 2·5 cm. long; leaf-rhachis pilose ..... 42. **itoliensis.**
Uppermost pair of leaflets about 6 cm. long; inflorescence about 5 cm. long; leaf-rhachis minutely puberulous to glabrescent 43. **mpalensis.**

‡‡Leaf-rhachis and axis of inflorescence glabrous :
Pedicels stout, about 3 mm. long; flowers crowded; leaflets 2–3 pairs (*see* page 142, fig. 7)..... 44. **Hockii.**
Pedicels very slender, 5–8 mm. long; flowers laxly arranged; leaflets 4–5 pairs ..... 45. **Oliveri.**

††Bracteoles pubescent, puberulous or tomentose all over :
‡Leaf-rhachis pubescent :
Rhachis expanded but not developed into distinct stipels below the pairs of leaflets; Angola :
Uppermost pair of leaflets ovate; leaflets about 15 cm. long ..... 46. **spicaeformis.**

Uppermost pair of leaflets obliquely-elliptic, broadest above the middle; leaves about 8 cm. long or less ... 47. **Bakeriana.**

Rhachis winged below the 3–5 pairs of leaflets and usually expanded into distinct stipels (*see* page 142, fig. 5):

Leaflets 2–3 pairs, obliquely rounded and emarginate at the apex; Angola ..... 48. **obliqua.**

Leaflets 3–7 pairs, shortly pointed at the apex:

Inflorescence more or less pyramidal; leaflets 3–5 pairs ..... 49. **Randii.**

Inflorescence ellipsoid, dense-flowered; leaflets 6–7 pairs ..... 50. **Bragaei.**

‡‡Leaf-rhachis glabrous:

Leaflets 2-pairs; inflorescence about 12-flowered; bracteoles 8 mm. long (*see* page 142, fig. 11)..... 51. **Gairdnerae.**

Leaflets about 4 pairs or more; inflorescence many-flowered:

Leaflets obtuse or rounded at the apex and base; inflorescence not branched; stipels inconspicuous:

Leaflets elliptic - lanceolate, obtusely pointed; bracteoles distinctly pubescent 52. **edulis.**

Leaflets broadly obliquely elliptic, rounded and emarginate; bracteoles puberulous ..... 53. **euryophylla.**

Leaflets narrowed at both ends, acuminate at the apex; inflorescence with a lateral branch at the base; stipels prominent (*see* page 142, fig. 9) ..... 54. **appendiculata.**

## Section 1. Stipulatae.

1. **B. lufirensis** *De Wild* in Fedde Repert. 11 : 512 (1913).

Belgian Congo : Lufira River Valley, tree, fl. 6 Oct. 1911, *Hock* (type)!

Portuguese E. Africa : without locality, *Stocks* 27a!

2. **B. stipulata** *De Wild.* in Ann. Mus. Congo Ser. IV. 44. t. XII (sub. nom. *B. appendiculata* De Wild., non Benth.) (1902).

BELGIAN CONGO: Katanga Prov.; Lukafu, fl. 18 Aug. 1899, *Verdick* (type)!

NATIVE NAME: Sandwe (*Verdick*).

According to Verdick, the natives make cord from the bark.

3. **B. Holtzii** *Harms.* in Engl. Bot. Jahrb. 33: 154 (1902).

TANGANYIKA TERRITORY: Dar-es-Salaam, fl. Nov. 1901, *Holtz* 31 (type)!

4. **Brachystegia Taubertiana** *Hutch. et B. Davy*, sp. nov.

*Ramuli* hornotini elongati, laxe foliati, circiter 3 mm. diametro glabri. *Alabastra* conica, circiter 5 mm. longa, puberula. *Folia* 12–15 cm. longa; rhachis glaber; foliola 3–4-juga, lanceolata, apice obtusa, emarginata, basi unilateraliter rotundata, usque ad 7 cm. longa et 2·3 cm. lata, chartacea, glabra; nervi laterales utrinsecus circiter 10, basales ascendentes; stipulae persistentes, basi foliaceae, oblongo-lanceolatae, obtusae, 1·5–2 cm. longae, 5–7 mm. latae, appendiculo lineare glabro; stipelae oblongo-ovatae, obtusae, circiter 1 mm. longae, glabrae. *Inflorescentia* breviter ramosa, circiter 5 cm. longa, fusco-tomentella; bracteae late ovatae, circiter 3 mm. longae. *Bracteolae* late ovatae. *Flores* juniores tantum visi.

TANGANYIKA TERRITORY: Usambara; Doda, Feb. 1893, *Holst* 3023!

5. **B. velutina** *De Wild.* in Fedde Repert. 11: 512 (1913).

BELGIAN CONGO: Elisabethville, 1911, *Hock* (type)! *Ringoet* 1916, *in Herb. Burtt Davy* 17784! Tschinsenda, about 1400 m., fl. Oct. 1912, *Rogers* 10371!

6. **B. Bequaertii,** *De Wild.* in Fedde Repert. 11: 512 (1913).

BELGIAN CONGO: Sankisia, a small tree in the Savannah, *Bequaert* 211 (type)!

ANGOLA: between the Kusaba and Kunene Rivers, fr. Feb. 1907, *Gossweiler* 2867 (in part, *in Herb. Mus. Brit.*)!

NATIVE NAME: Samba (*Gossweiler*).

7. **B. Goetzei** *Harms.* in Engl. Bot. Jahrb. 30: 318, t. xiii (1901).

TANGANYIKA TERRITORY: Unyika; near Dorf Piseki, Buschwald at 1400 m., fl. Nov. 1899, *Goetze* 1423 (type)!

NATIVE NAME: nGuanzo.

8. **Brachystegia filiformis** *Hutch. et B. Davy*, sp. nov.

*Arbor* parva; ramuli annotini circiter 5 mm. diametro, leviter sulcati, breviter et molliter pubescentes, hornotini straminei, internodiis 4–5 cm. longis. *Alabastra* lateraliter compressa, anguste ovoidea, tomentella, 4–5 mm. longa. *Folia* 20–30 cm. longa; rhachis supra canaliculatus, molliter et breviter pubescens, infra foliola leviter elevatus; foliola 12–18-juga, opposita vel rare subopposita, lanceolato-oblonga, emarginata, basi inaequaliter cordata, 3·5–5 cm. longa, 1·2–1·5 cm. lata, coriacea, costa media utrinque parce pubescente excepta glabra,

infra pallidiora, subglauca, ciliolata; nervi laterales utrinsecus 6–8, basales ascendentes, superiores patuli, omnibus intra marginem distincte conjunctis; stipulae basi foliaceae et reniformes, circiter 1·5 cm. latae, undulatae vel irregulariter dentatae, glabrae, nervosae, appendiculo filiforme circiter 1·5 cm. longo rubescente; stipelae 0. *Flores* non visi. *Legumen* (incompletum tantum visum) durum, circiter 3·5 cm. latum, glabrum.

RHODESIA: N.W. Rhodesia; Broken Hill, about 1250 m., Nov. 1909, *Rogers* 8605 (type)! S. Rhodesia; Haroni River about 1800 m., fr. Sept. 1906, *Swynnerton* 1028! Victoria Falls, in sandveld, *Burtt Davy* 17831!

NATIVE NAMES: umBfuti (Chindao), amaChibero (Mashona); mBombo (Chilundi) mooSamba (Chikaundi and Chinyanja), Mumbu (Kota Kota).

According to Swynnerton this is a small tree with fibrous bark used as cord.

9. **B. Boehmii** *Taub.* in Engl. Pfl. Ost. Af. C: 197 (1895).

TANGANYIKA TERRITORY: Lake District; Pori near Igonda, *Boehm* 159a (type)!

NYASALAND: Mlanje, 950–1800 m., fl. Oct. 1905, *Purves* 194!

RHODESIA: S. Rhodesia; Haroni R. at about 1650 m. *Swynnerton* 1028!

NATIVE NAME: mJombo (*Purves*), umBfuti (Chindao).

According to Purves this is a small tree 20–30 ft. high, the inner bark of which is used for making cloth. Swynnerton also states that it is a small tree with fibrous bark used as cord.

10. **B. Woodiana** *Harms* in Engl. Bot. Jahrb. 30: 82 (1901).
*B. oblonga* Sim., For. Fl. Port. E. Afr. 49 (1909) ?

TANGANYIKA TERRITORY: Keegwah, about 1300 m. lat. 5° 5′ S., long. about 32° E., *Speke and Grant* 1!

NYASALAND: *Buchanan in Herb. Wood* 6960 (type)! Njombo, *Buchanan* 334 in *Herb. Mus. Brit.*!

PORTUGUESE EAST AFRICA: Quelimane; Magenja da Costa, and around Arenga, a common medium-sized tree, *Sim.* 5574 (not seen).

RHODESIA: S. Rhodesia; Salisbury, a fine tree, *Rand* 554!

NATIVE NAMES: Mecombo (*Speke & Grant*), Modi (*Sim*) Machabel (*Rand*).

According to Speke & Grant it is a common forest tree up to 50 ft. high, with few branches and "sensitive leaves"; the bark is converted into boats, corn-bins, roofing lashings, baskets, kilts for wear, mats, etc.; the timber is of little value, but is used for rafters in buildings. Sim states that the bark is used for the same purposes as that of "*B. spicaeformis*" (*B. Bragaei* ?). The pods are a favourite food of the elephant (*Rand*)—A sucker-shoot of a tree from Elisabethville (*Burtt Davy* 18017!), where it is known as "mooSaamba makooba," may represent this species.

## Section II. Caducae.

11. **Brachystegia glaucescens** *Hutch. et B. Davy*. sp. nov.

*Arbor* patula circiter 6·5 m. alta; ramuli annotini circiter 3 mm. crassi, glabri, lenticellati, hornotini breviter virgati, dense fulvo-pubescentes. *Folia* 5–9 cm. longa; rhachis pubescens; foliola imbricata, 14–18-juga, anguste oblonga, utrinque rotundata, 0·8–1·4 cm. longa, circiter 4 mm. lata, glabra, reticulata, glauca; stipulae caducae; stipelae 0. *Inflorescentia* paniculata, 2·5–3 cm. longa; axis fulvo-pubescens. *Bracteolae* obovatae, apice rotundatae, 5 mm. longae, 3·5 mm. latae, breviter fulvo-pubescentes. *Sepala* 5, parva, inaequalia, late obovata, ciliata, maxima circiter 2 mm. longa. *Ovarium* stipitatum, fulvo-hirsutum. *Fructus* non visus.

Belgian Congo: Katanga Prov.; Elisabethville, *Ringoet in Herb. Burtt Davy* 17785!

Rhodesia: S. Rhodesia; Umtali Div., 1915, *Teague* 300 (type)! Makoni Dist. about 1600 m., a spreading tree 20 ft. high, fl. July 1917, *Eyles* 813! Matoppo Hills, about 1600 m., a large tree, fl. Oct. 1903, *Eyles* 1250!

12. **Brachystegia Gossweileri** *Hutch. et B. Davy*, sp. nov.

*Arbor* usque ad 24 m. alta, trunco circiter 60 cm. diametro; ramuli annotini breves, pubescentes, striati, hornotini fulvo-pubescentes, canaliculati. *Folia* 5–7 cm. longa; rhachis pubescens, infra foliola incrassatus, sulcatus; foliola circiter 15-juga, imbricata, oblongo-lanceolata, apice obtusa, basi inaequaliter truncato-rotundata, circiter 15 mm. longa et 4–5 mm. lata, utrinque minute pubescentia, cinereo-glauca; stipulae deciduae; stipelae 0. *Inflorescentia* dense paniculata, 3·5–5 cm. longa, ubique breviter fusco-pubescens; bracteae late ovatae, circiter 2 mm. longae. *Bracteolae* oblongo-obovatae, circiter 6 mm. longae. *Sepala* 5, subaequalia, ovata, circiter 2 mm. longa, ciliata. *Ovarium* breviter stipitatum, dense hirsutum.

Angola: near Fort Princess Amelia, between Coconda and Cubango, right bank of Cubango River, a common tree up to 80 ft. high by 3 ft. diameter, forming extensive woods, fl. Sep. 1905, *Gossweiler* 2025 (type)!

Native Name: Lamba, or Samba ? (*Gossweiler*).

13. **B. katangensis** *De Wild*. in Ann. Mus. Congo, Ser. IV: 204 (1903).

Belgian Congo: Katanga Prov.; Lukafu, fl. Oct. 1899, *Verdick* 117 (type)!

Native Name: Kisamba-Kwe-Kwe.

14. **B. flagristipulata** *Taub*. in Engl. Pfl. Ost. Af. C: 198 (1895).

Tanganyika Territory: Usaramo, 1894, *Stuhlman* 6400 (type)!

Nyasaland: Lake Nyasa, in fr. only, *Archdeacon W. P. Johnson* 313! (probably belongs here).

15. **B. Wangermeeana** *De Wild*. in Fedde Repert. 11: 513 (1913).

Belgian Congo: Katanga Prov.; Elisabethville, 1911, *Hock* (type)!

6. **B. Wildemaniana** *R. E. Fries* in Wiss. Ergeb. Schwed. Rhod.-Kongo-Exped., 1911–12, 1 : 68 (1914).

RHODESIA : N.E. Rhodesia; Malolo–Katewe between Lakes Bangweolo and Tanganyika, fl. Nov. 1911, *R. E. Fries* 1204 (type)!

17. **B. tamarindoides** *Welw. ex Benth.* in Trans. Linn. Soc. 25 : 312 (1866).

ANGOLA : Huilla; between Lopollo and the lake of Ivantala, common, occasionally constituting little woods, fl. Oct. 1859, young fr. Feb. 1860, *Welwitsch* 585 (type)!; wooded places on the banks of the river Cacolabar, *Welwitsch* 585b! 4157! Kubango, right bank of the river near the Fort Princess Amelia, fl. Oct. 1905, *Gossweiler* 2136! Malange Distr., *Gossweiler* 1352!

BELGIAN CONGO : Katanga Prov., near Elisabethville, fr. Aug. 1919, *Burtt Davy* 17845! 18016!

NATIVE NAME : mooSaamba kiloko.

String is prepared from the bark (*Burtt Davy*).

18. **B. microphylla** *Harms* in Engl. Bot. Jahrb. 28 : 397 (1900).

TANGANYIKA TERRITORY : Uhehe, *Goetze* 603 (type)! Muena Plateau, tree up to 40 m. high, fr. 14 June 1903, *Busse* 2867! Without locality, *Busse* 190!

19. **B. taxifolia** *Harms* in Engl. Bot. Jahrb. 33 : 155 (1902).

TANGANYIKA TERRITORY : between Gominyi and Bueni, *von Prittwitz and Gaffron* 54 (type)!

20. **Brachystegia mimosaefolia** *Hutch. et B. Davy*, sp. nov.

*Arbor* circiter 6·5 m. alta; ramuli annotini circiter 3 mm. diametro, molliter hispidi, hornotini breviter fulvo-villosi. *Folia* 5·5–6·5 cm. longa; rhachis laxe pilosus, inter foliola anguste expansus; foliola imbricata, circiter 25-juga, oblique lanceolata, apice obtusa basi rotundata, circiter 1 cm. longa, et 0·2 cm. lata, discoloria, utrinque minute pubescentia et ciliolata, costa fere marginale utrinque elevata; stipulae deciduae, basi biauriculatae et foliaceae, circiter 3 mm. longae, appendiculo lineare 1 cm. longo pubescente et margine fimbriato; stipelae 0. *Inflorescentia* subsessilia, parce ramosa, 1·5–3 cm. longa, late triangularia; bracteae late ovatae, 2·5–3 mm. longae, pubescentes, striatae. *Bracteolae* obovato-ellipticae, coriaceae, circiter 9 mm. longae et 3–4 mm. latae, molliter pubescentes. *Sepala* 5, fere orbicularia, usque ad 3 mm. longa, interdum bilobata, ciliata. *Ovarium* stipitatum, fulvo-villosum. *Legumen* (incompletum tantum visum) lignosum, circiter 3 cm. latum, glabrum.

RHODESIA : N.W. Rhodesia; Broken Hill, about 1300 m., fl. Sep. 1909, *Rogers* 8552 (type)!

BELGIAN CONGO : Katanga Province; Mokambo, near Elizabethville, about 830 m., an ornamental tree with umbrella-shaped head, common, fr. 3 Aug. 1919, *Burtt Davy* 18004! 17802b!

NATIVE NAME : nGanza (Katanga).

21. **B. pectinata** *Sim*, For. Fl. & For. Resources of Port. E. Afr. 50 (1909).

PORTUGUESE E. AFRICA: Quelimane; Magenja da Costa and Nhamacurra, not common, tree about 60 ft. high, with straight, clean, white stem ,and densely pubescent twigs and rhachis, *Sim* 6099 (type)—not seen.

22. **B. longifolia** *Benth.* in Hook. Ic. Pl. 14: t. 1359 (1881).

NYASALAND: Shire Highlands, *Buchanan* 22 (type)! 217 (in part, *Herb. Mus. Brit.*)!

NATIVE NAME: nJombo.

Buchanan calls it a "Bark-cloth tree" and states that the wood is very soft.

23. **Brachystegia reticulata** *Hutch. et B. Davy*, sp. nov.

*Arbor* patula circiter 6·5 m. alta; ramuli virgati, parce puberuli et distincte lenticellati, hornotini molliter pubescentes, circiter 1–5 mm. diametro. *Alabastra* conica, 5–6 mm. longa, pubescentia. *Folia* 7–9 cm. longa; rhachis pubescens, infra foliola incrassato-expansus; foliola circiter 15-juga, circiter 0·5 cm. discontigua, lanceolata vel oblongo-lanceolata, obtuse rotundata, inaequaliter cordata, circiter 1·4 cm. longa et 4 mm. lata, glabra et prominenter reticulata; stipulae deciduae; stipelae 0. *Inflorescentia* paniculata, laxe ramosa, pauciflora, circiter 4 cm. longa; axis fulvo-pubescens; bracteae deciduae, ovatae, pubescentes. *Bracteolae* late oblongo-obovatae, 4 mm. longae, 2·5–3·5 mm. latae, pubescentes. *Sepala* 5, subaequalia, oblongo-ovata, obtusa, 2 mm. longa, minute et parce ciliolata. *Ovarium* breviter stipitatum, dense hirsutum. *Legumen* lignosum, circiter 11 cm. longum et 3·5 cm. latum, glabrum.

RHODESIA: S. Rhodesia; Umtali Div., Odzani River Valley, 1915, *Teague* 299 (type)! At umTegesi's village on the Kootooro River, a branch of the Sabi, fr. July 1870, *Baines*! Makoni Distr., about 1500–1560 m. spreading tree 20 ft., fr. July 1917, *Eyles* 813! The following specimens probably belong here:—

PORTUGUESE EAST AFRICA: Moramballa, about 1000 m., *Kirk*!; Gazaland, Madanda Forest, about 120 m., *Swynnerton* 1026!

24. **B. Fischeri** *Taub.* in Engl. Pfl. Ost. Afr. C: 197 (1895).

TANGANYIKA TERRITORY: Usuri, *Fischer* 148 (type)!

The following imperfect specimen may belong here: PORTUGUESE EAST AFRICA; Madanda forests, common at Amsate, about 130 m., fr. Dec. 1906, *Swynnerton* 1026! native name, Munzi (Chindao).

25. **Brachystegia apertifolia** *Hutch. et B. Davy*, sp. nov.

*Arbor* patula 6·5–10 m. alta; ramuli annotini circiter 3 mm. diametro, lenticellati, molliter pubescentes, hornotini striati, pubescentes. *Folia* 15–20 cm. longa; rhachis sulcatus; foliola circiter 8-juga, 1·5–2 cm. discontigua, oblongo-linearia, apice rotundata, inaequaliter truncata, inaequilonga, inferiora circiter 2 cm. longa et 0·7 cm. lata, intermedia circiter 5 cm. longa et

1 cm. lata, superiora circiter 4·5 cm. longa et 1 cm. lata, utrinque parce pubescentia, ciliolata, venosa; nervi laterales utrinsecus circiter 6–9, basales ascendentes, cum ceteris prominenter conjuncti; stipulae deciduae; stipelae minutae. *Inflorescentia* laxe paniculata, circiter 5 cm. longa; axis pubescens. *Bracteolae* oblongo-obovatae, circiter 5 mm. longae et 3·5 mm. latae, puberulae. *Sepala* 5, subaequalia, oblonga, ciliata. *Ovarium* stipitatum strigoso-hirsutum.

BELGIAN CONGO: Dilolo, June 1908, *Sapin*!

NYASALAND: nTondwe, 1905, *Cameron* 134 (type)!

ANGOLA: Pedras de Guinga, between Condo and Quisonde, fr. March 1857, *Welwitsch* 571! May belong here.

NATIVE NAME: mooZamba (*Welwitsch*).

26. **Brachystegia utilis** *Hutch. et B. Davy*, sp. nov.

*Arbor* alta vel circiter 6·5–10 m. alta; ramuli annotini pubescentes, circiter 2 mm. crassi, hornotini fulvo-pubescentes. *Alabastra* anguste conica, circiter 5 mm. longa, puberula. *Folia* 8–15 cm. longa; rhachis hirsutus, canaliculatus, inter foliola anguste expansus; foliola plerumque discontigua, rare subcontigua, 8–9-juga, oblique oblonga ad lanceolato-oblonga, apice rotundata vel emarginata, basi inaequaliter rotundata, 2–4 cm. longa, 0·7–1·5 cm. lata, leviter discoloria, utrinque distincte reticulata et parce pubescentia; stipulae deciduae, intrapetiolares, filiformes, circiter 8 mm. longae, pubescentes; stipelae 0. *Inflorescentia* ramosa, densiflora, 4–10 cm. longa; axis dense fulvo-pubescens; pedicelli usque ad 3 mm. longi; bracteae parvae, caducae. *Bracteolae* 5 mm. longae, 3·5 mm. latae, brevissime pubescentes. *Sepala* 5, parva, subaequalia, ciliolata. *Ovarium* sessile, dense hirsutum. *Legumen* lignosum, 6 cm. longum, 2·5 cm. latum, glabrum. *Semina* oblongo-elliptica, circiter 1·5 cm. longa et 1 cm. lata.

NYASALAND: Mlanje, about 1000 to 1600 m., a small tree 20–30 ft., fl. Oct. 1905, *Purves* 193 (type)! without precise locality, *Buchanan* 217! Zomba and vicinity about 800 to 1250 m. a tall tree, fl. Dec. 1896, *Whyte*!

PORTUGUESE EAST AFRICA: Mozambique Territory; Mossurizi, up to 1300 m., a sturdy, much-branched tree, common all over, fr. Feb. 1907, *W. H. Johnson* 105!

BELGIAN CONGO: Katanga Province; Kimbaëmbe River near Elisabethville, fr. Aug. 1919, *Burtt Davy* 17962!

ANGOLA: Huilla; between Mumpulla and Nene, a small tree about 8 ft. high, with the habit, nearly, of a Pistacia, occurring sparingly in forests of Eugenia, Proteaceae, etc., *Welwitsch* 584!

NATIVE NAMES: Nangwesu (Mlanje); mooSaamba (Katanga).

According to Purves this is one of the bark-cloth trees; in Katanga Province string is obtained from the bark (*Burtt Davy*).

27. **B. Mildbraedii** *Harms* in Notizbl. Bot. Gart. Berlin 8: No. 72: 151 (1922).

CAMEROONS: near Makalat, between Bipindi and Ebolowa, fl. Dec. 1913, *Mildbraed* 7581 (type)!

28. **Brachystegia puberula** *Hutch. et B. Davy*, sp. nov.

*Arbor* patula, circiter 12 m. alta; ramuli annotini glabri, lenticellati, 3 mm. crassi, hornotini minute puberuli et striati. *Folia* circiter 15 cm. longa; rhachis minute puberulus, canaliculatus, infra leviter expansus; foliola 10–12-juga, oblonga, apice rotundata, leviter emarginata, basi subaequaliter rotundata 2·5–3·5 cm. longa, 1–1·5 cm. lata, chartacea, utrinque minute puberula; nervi laterales inconspicui; stipulae deciduae; stipelae 0. *Inflorescentia* paniculata, densiflora, circiter 5 cm. longa, ubique fusco-puberula; pedicelli 1·5 mm. longi. *Bracteolae* oblongo-obovatae, circiter 5 mm. longae et 3 mm. latae. *Sepala* 5, late oblonga, 2 mm. longa. *Ovarium* stipitatum, parce pubescens.

Angola: Between the Kusaba and Kunene rivers, a common tree extending from the Kakonda to the river Kueve, fl. Feb. 1907, *Gossweiler* 2867 in part, (*Herb. Mus. Brit.*)!

Native Name: Samba.

29. **Brachystegia leonensis** *Hutch. et B. Davy*, sp. nov.

*Arbor* excelsa usque ad 30 m. alta; ramuli annotini glabri, circiter 3 mm. diametro, hornotini glabrescentes. *Alabastra* parva et inconspicua. *Folia* circiter 25 cm. longa; rhachis subteres, parce pilosus; foliola 8–11-juga, contigua, oblongo-lanceolata leviter falcata, ad apicem obtusum leviter angustata, basi aequaliter obtusata, 7–8 cm. longa, 2–2·5 cm. lata, papyracea, supra glabra et nitida, infra costa media prominente rufo-pilosa excepta glabra; nervi laterales utrinsecus 8–10, utrinque distincti; stipulae deciduae; stipelae 0. *Inflorescentia* paniculata, densiflora, 7 cm. longa, ubique rufo-tomentella; bracteae late ovatae. *Bracteolae* oblongae, 1·4 cm. longae, 0·4 cm. latae. *Sepala* subaequalia, late obovato-rotundata, circiter 3 mm. longa, dentata. *Ovarium* stipitatum, hirsutum. *Legumen* non visum.

Sierra Leone: Kambui, tree 100 ft. high, fl. March 1914, *Lane-Poole* 188!

Native Name: Bodgei.

Lane-Poole notes that the tree exudes a brown resin.

30. **Brachystegia Allenii** *Hutch. et B. Davy*, sp. nov.

*Arbor* magna, patula; ramuli annotini glabri longitudinaliter striati, circiter 3 mm. crassi, hornotini glabri, striati. *Folia* 10–14 cm. longa; rhachis glaber, sulcatus, inter foliola anguste expansus; foliola discontigua, 4–5-juga, oblique oblonga, apice profunde emarginata, basi inaequaliter truncato-rotundata, circiter 2·5–4·5 cm. longa, 1·5–2 cm. lata, leviter coriacea, utrinque prominenter reticulata et glabra; costa media elevata sulcata; nervi laterales utrinsecus 6–8, basales ascendentes, superiores patuli, omnes intra marginem distincte conjuncti; stipulae deciduae, basi foliaceae et reniformes circiter 0·4 cm. latae, glabrae, reticulatae, appendiculo filiforme circiter 1 cm. longo rubescente parce ciliato; stipelae 0. *Inflorescentia* laxe ramosa, 4–5 cm. longa, 4 cm. lata; axis glaber; pedicelli usque ad 1 mm. longi; bracteae 2 mm. longae, ovatae, glabrae, ciliolatae, deciduae. *Bracteolae* oblongo-rotundatae 5–6 mm. longae,

3·5 mm. latae, glabrae, striatae. *Sepala* 5, inaequalia, fimbriata, maxima circiter 3 mm. longa. *Ovarium* stipitatum, dense hirsutum. *Legumen* lignosum, 12 cm. longum, 3·5–4 cm. latum, glabrum.

Portuguese East Africa : Sandy hills at mouth of mSala River, fl. Nov. 25, 1911, *Allen* 93 (type)!

Tanganyika Territory : Saliman–Mamba, fr. 6 June 1903, tree 12–18 m. high, *Busse* 2780.

According to Allen the bark is used to make native river craft.

31. **B. glaberrima** *R. E. Fries* in Wiss. Ergeben. Schwed. Rhod.–Kongo–Exped. 1911–12. 1 : 66 (1914).

Rhodesia : N.E. Rhodesia; Mporokoso, between Lakes Bangweolo and Tanganyika, fl. 31 Oct. 1911, *R. E. Fries* 1177 (type) ! Miali, near Lake Bangweolo, *R. E. Fries* 1065 !

32. **B. angustistipulata** *De Wild.* in Fedde Repert. 11 : 511 (1913).

Belgian Congo : Katanga Prov.; Sankisia, a tall tree in bush-savannah, *Bequaert* 165 (type) !

33. **B. polyantha** *Harms* in Engl. Bot. Jahrb. 30 : 319 (1901).

Tanganyika Territory : Untali, Kivira-Thal, about 1400 m., fl. Nov. 1899, *Goetze* 1478 (type) !

34. **B. Bussei** *Harms* in Engl. Bot. Jahrb. 33 : 155 (1902).

Tanganyika Territory : Ungoni; Mampyui Road, fl. Decem. 1900, *Busse* 729 (type) !

35. **B. cynometroides** *Harms* in Engl. Bot. Jahrb. 26 : 267 (1899).

Cameroons : Lolo Stationsberg, fl. Jan. 1895, *Staudt* 10 (type) ! Bipinde, 1907, *Zenker* 3390 ! Bipinde 1908, *Zenker* 3640 !

36. **B. eurycoma** *Harms* in Engl. Bot. Jahrb. 49 : 424 (1913).

Cameroons : Dodo, about 700 m., tree 20–30 m. high, fl. March, 1909, *Ledermann* 2905 (type) ! Ebendort, *Ledermann* 2990.

S. Nigeria : Yoruba, fl. April 1890, *Millson !*

Native Name : Akolodo (Yoruba).

Millson states that it yields a gum.

37. **B. floribunda** *Benth.* in Hook. Ic. Pl. 14 : 43 (1881).

Nyasaland : Shire Highlands, *Buchanan* 10 (type) ! 11 !

38. **B. Zenkeri** *Harms* in Engl. Bot. Jahrb. 45 : 298 (1910).

Cameroons : Bipinde, 1908, *Zenker* 3695 (type) !

39. **B. Klainei** *Pierre ex Harms* in Engl. Bot. Jahrb. 40 : 30 (1907).

Gabon : near Libreville, tree 12–28 m., *Klaine* 8 (type) ! 3260 ! 3319 !

Angola : forest on the banks of the River Luali, at Belize, Dec. 1918, *Gossweiler* 7615 !

40. **B. Lujae** *De Wild.* MSS.

*Ramuli* annotini minute puberuli ad glabrescentes, 3 mm. diametro, minute lenticellati, purpureo-brunnei, hornotini leviter

elongati, breviter pubescentes. *Alabastra* minuta, pubescentia. *Folia* 13–15 cm. longa; rhachis pubescens, infra foliola dilatatus, sulcatus; foliola 5-juga, valde inaequalia, inferiora elliptico-oblonga, 2 cm. longa, 1 cm. lata, tenuiter papyracea, superiora late-oblique lanceolata, ad apicem obtusum breviter angustata, unilateraliter anguste rotundata, 7·5 cm. longa, 2·5 cm. lata, utrinque costa media puberula excepta glabra; nervi laterales numerosi, prominuli, basales ascendentes; stipulae caducae; stipelae 0. *Inflorescentia* spiciformis, circiter 5 cm. longa, 3 cm. lata; axis fere glaber; bracteae caducae; pedicelli graciles, circiter 7 mm. longi, glabri. *Bracteolae* obovato-oblongae, glabrae, striatae, circiter 7mm. longae et 3mm. latae. *Sepala* minuta, lineari-lanceolata. *Ovarium* breviter stipitatum, ferrugineo-hirsutum.

Belgian Congo: Forest of the Sankuru, fl. Aug. 1902, *Luja* 51 !

41. **Brachystegia venosa** *Hutch. et. B. Davy*, sp. nov.

*Arbor* circiter 9 m. alta; ramuli annotini glabrescentes, circiter 3 mm. crassi, striati, hornotini molliter pubescentes. *Alabastra* late conica, 0·5–1·3 cm. longa, puberula, squamis ciliolatis. *Folia* circiter 1 cm. longa; rhachis molliter pubescens, sulcatus, infra foliola late expansus; foliola valde discontigua, 3–4-juga, oblique oblongo-lanceolata, apicem versus leviter angustata, emarginata, base inaequaliter rotundata, inferiora 2–2·5 cm. longa, 1–1·3 cm. lata, superiora 4–6·5 cm. longa et 1·5–1·7 cm. lata, chartacea, conspicue venosa, costa media puberula excepta glabra; nervi laterales utrinsecus circiter 6, supra conspicui, basales ascendentes; stipulae deciduae; stipelae rhachidis apicem versus plerumque evolutae, paxilliformes. *Inflorescentia* spiciformis, pauciflora, circiter 2·5 cm. longa; axis puberulus; pedicelli graciles, circiter 3 mm. longi, puberuli. *Bracteolae* elliptico-obovatae, 6 mm. longae, 3·5 mm. latae, fere glabrae. *Sepala* 2, lanceolata, ciliolata, 1–1·5 mm. longa, vel 0. *Ovarium* stipitatum, hirsutum. *Legumen* non visum.

Uganda: Stevenson Road, fl. Nov., *Scott Elliot* 8380 ! 8389 in *Herb. Mus. Brit.* !

Rhodesia: N.W. Rhodesia; Highveld near the Victoria Falls, erect tree 30 ft. high, fl. Sep. 1905, *Allen* 165 (type) !

42. **B. itoliensis** *Taub.* in Engl. Pfl. Ost. Afr. C: 197 (1895).

Tanganyika Territory: Victoria Nyanza; Itolio, fl. Nov. 1890, *Stuhlmann* 925 (type) !

43. **B. mpalensis** *Micheli* in Compt. Rend. Soc. Bot. Belg. 36: 73 (1897); Illustr. Fl. Cong. t. LXXXVIII.

Belgian Congó: m'Pala, *Descamps* 27 (type) ! m'Towa, fl. Aug. 1895, *Descamps !*

Rhodesia: N.W. Rhodesia; Chilanga, fl. Sep. 1909, *Rogers* 8451 ! Broken Hill about 1300 m., *Rogers* 8608 ! S. Rhodesia; Victoria, *Munro* 330 !

According to Descamps this is a large tree, the wood of which is excellent for constructive purposes. The bark is used as a remedy for coughs (*Rogers*).

NATIVE NAMES: Kapootoo (Chinyanja), Mapootoo (Chikaundi), mPutchi (Chilumda), teste Rogers.

44. **B. Hockii** *De Wild.* in Fedde Repert. 11 : 512 (1913). *B. Hockii* var. *papyracea* De Wild, MSS. *B. trijuga* R. E. Fries in Wiss. Ergeb. Schwed. Rhod.–Kongo–Exped. 1911–12, 1 : 65, t. 9, fig. 1 (1914.) *B. mpalensis* var. *latifoliata* De Wild. Etud. Fl. Katang. 45 (1902).

BELGIAN CONGO: Katanga, 1911, *Hock* (type)! near Lukafu, fl. Aug. 1899, *Verdick* 64! Sankesia, fl. Aug. 1911, *Bequaert* 170! Elisabethville, fr. Aug. 1919, the predominant tree, *Burtt Davy*, 17815! 17966!

ANGOLA: Malange District, *Gossweiler* 1324! 1337! Kubango, *Gossweiler* 1911; River Kutchi, *Gossweiler* 3370!

RHODESIA: N.E. Rhodesia; between the Luapula and Luera Rivers; fl. Sep. 1911, *R. E. Fries* 586! Meali, near Lake Bangweolo Oct. 1911, *R. E. Fries* 1068! N.W. Rhodesia; Bwana Makubwa Aug. 1911, *R. E. Fries* 321! S. Rhodesia; Victoria Falls, in sandveld, *Burtt Davy* 17835!

NATIVE NAMES: Mookootu (*Verdick*), Kapootoo (*Burtt Davy*), Mushovi (*Gossweiler*).

The type of *B. Hockii* is a bad, scale-infested specimen.

45. **B. Oliveri** *Taub.* in Pfl. Ost. Afr. C : 197 (1895).

KENYA COLONY: Mombasa, *Wakefield* (type)!

46. **B. spicaeformis** *Benth.* in Trans. Linn. Soc. 25 : 312 (1866).

ANGOLA: Huilla, *Welwitsch* 579 (type)! 578! 617! 580 (in *Herb. Mus. Brit.*) 583! 575! Kubango, woods of Fort Princess Amelia, *Gossweiler* 1965! 3846! in *Herb. Mus. Brit.*! and without definite locality 1809! Lubango, side of the high plateau, in open country about 2000 m., an umbrella-shaped tree 9 m. high, with spreading branches, the pods nearly all at the top showing above the leaves, fr. May 1909, *Pearson* 2650!

BELGIAN CONGO: Katanga Prov.; near Elisabethville, *Burtt Davy* 17850!

NATIVE NAME: Moobanda (*Gossweiler*), Kapootoo (*Burtt Davy*).

47. **Brachystegia Bakeriana** *Hutch. et B. Davy*, sp. nov.

*Arbor* decidua, 8 m. alta; ramuli annotini glabri, inconspicue lenticillati, circiter 1·5 mm. crassi, hornotini breves, breviter pilosi, demum glabrescentes. *Folia* 3·5–6 cm. longa; rhachis parce pilosus, infra foliola leviter expansus; foliola discontigua, 2–3-juga, obliquissime oblongo-elliptica, emarginata, unilateraliter rotundata, terminalia 2–3·5 cm. longa, 1·5–2 cm. lata, chartacea, cinereo-glauca, glabra, reticulato-venosa; stipulae deciduae; stipelae 0. *Inflorescentia* spiciformis, densiflora, circiter 2·5–3 cm. longa; bracteae non visae; axis dense pubescens; pedicelli graciles, ad 4 mm. longi, pubescentes. *Bracteolae* late obovato-oblongae, circiter 7 mm. longae, 3·5 mm. latae, pubescentes.

*Sepala* nulla. *Tubus staminalis* usque ad 4 mm. longus. *Ovarium* stipitatum, pubescens. *Legumen* lignosum, oblongum, truncatum, 9 cm. longum, 3 cm. latum, glabrum. *Semina* circiter 1·5 cm. longum et ultra 1 cm. latum.

ANGOLA : Ganguella country, east of Kubango River, fl. June 1906, *Gossweiler* 2595 (type) ! a deciduous tree up to 25 ft. high; left bank of River Cumassa, a tributary of the Quembo, fl. Aug. 1906, *Gossweiler* 2652 !

NATIVE NAMES : Mutete, Mushobi, mooAngombe (*Gossweiler*)

Named in compliment to Mr. E. G. Baker of the Botanical Department, British Museum.

48. **Brachystegia obliqua** *Hutch. et B. Davy*, sp. nov.

*Arbor* usque ad 8 m. alta; truncus circiter 13 cm. diametro; ramuli annotini pubescentes, lenticellati, circiter 2·5 mm. crassi, hornotini dense fulvo-pubescentes. *Folia* 5–8 cm. longa; rhachis pubescens, supra canaliculatus; foliola 3-juga, discontigua, obliquissime oblongo-elliptica, emarginata, basi unilateraliter rotundata, terminalia 3–4 cm. longa, 1·5–2·3 cm. lata, chartacea vel subcoriacea, utrinque breviter pubescentia, demum fere glabra, adulta conspicue reticulata; nervi laterales numerosi, basales ascendentes prominentes; stipulae deciduae; stipelae prominentes, paxilliformes, ad 2 mm. longae, pubescentes. *Inflorescentia* spiciformis, densiflora, fusco-pubescens vel subtomentosa; bracteae lineares, 4–5 mm. longae; pedicelli 3 mm. longi. *Bracteolae* obovato-ellipticae, circiter 7 mm. longae. *Sepala* lineari-lanceolata, ciliata, ad 2 mm. longa. *Tubus staminalis* 4 mm. longus. *Ovarium* stipitatum, pubescens.

ANGOLA : between T'Chirandongombe and River Longa, fl. June 1906, *Gossweiler* 2711 (type) ! T'Chancambe, in mixed woods, fl. Aug. 1906, an evergreen tree up to 35 ft. high, *Gossweiler* 2640 ! between Cotoso and Cavange, in the denser secondary woods, fl. Aug. 1905, *Gossweiler* 1902, between Simbola Candingo and Kubango, fl. Oct. 1905, *Gossweiler* 2151 !

NATIVE NAME : mTete.

49. **B. Randii** *Bak. fil.* in Journ. Bot. 1899 : 433.
*B. spicaeformis* var. *parviflora* Benth. in Trans. Linn. Soc. 25 : 313 (1866).

BELGIAN CONGO : near Elisabethville, *Ringoet* in *Herb. Burtt Davy* 17846b !

TANGANYIKA TERRITORY : Robeho, Lat. 6° 38′ S., alt. 4700 ft., *Speke* and *Grant* 32.

NYASALAND : Mlanje Plateau, at 2000 m., small tree 15–20 ft. high with rather flat crown, fl. and fr. Oct. 1905, *Purves* 208 !

RHODESIA : S. Rhodesia; Salisbury, *Rand* 610, 611 (types) ! a frequent tree of good size, on the Mashonaland Hills; flowers sweet-scented. Near Salisbury about 1600 m. tree 20–40 ft. fl. Oct. 1916, *Eyles* 648 ! large spreading tree, common, fl. Sep 1917, *Eyles* 845 ! *Rogers* 5796 ! Umtali Div., Odzani River Valley, 1914, *Teague* 301 ! Victoria Falls, in Sandveld, *Burtt Davy* 17834 ! *Gibbs* 145 ! Livingstone, *Rogers* 17456 ! without locality, in 1870,

*Baines* ! Queque, *Rogers* 5845 ; Sebakwe, about 1350 m., large tree fl. Sep. 1904, *Eyles* 174 ! Victoria, *Monro* 456 ! 468 ! 526 ! 540 !

Native Names : mSaassa (*Rand*, *Eyles*), mChenga or mNenga (*Speke* and *Grant*), mChenga (*Purves*).

According to Speke and Grant the bark is made into quilts, cloths, band-boxes, huge grain-stores, mats, roofing for camp huts, etc., and a red juice exudes on cutting the bark. Purves also states that a cloth is made from the inner bark. According to Rand the inner bark is used by the natives for twine or rope; they prepare it very quickly and readily by rubbing between the palms of the hands. The tree is very plentiful, and yields large quantities of a gum deep red in colour and very rich in tannin; it should be of some commercial value (*Rand*).

50. **B. Bragaei** *Harms* in Engl. Bot. Jahrb. 30 : 82 (1901).

Portuguese East Africa : Moçambique Territory; Beira, *Braga* 152 (type) !

Rhodesia : S. Rhodesia; Melsetter Distr., about 200 m., fl. Sep. 1907, a smallish tree, stamens white, *Swynnerton* 657 ! Nyahodi River at 1650 m., a small tree, *Swynnerton* 1027 !

"One of the commonest S. Rhodesian trees; fairly plentiful in the neighbourhood of Chirinda and about Chikore and groves of it are common in the hills all along the Nyahodi and Haroni Rivers, and cover the lower slopes of the Chimanimani foothills, while toward the summit one finds a few scattered trees, remarkably fine in sheltered positions even at 7000 ft." (*Swynnerton.*)

Native Name : mooTsatsa (*Swynnerton*).

The bark is largely used by the natives as a substitute for rope and, beaten soft, for bags; formerly employed in the manufacture of clothes and blankets. It is prized on account of being red in colour and comparatively soft and pliable. (*Swynnerton.*)

51. **Brachystegia Gairdnerae** *Hutch. et B. Davy*, **sp. nov.**

*Arbor ;* ramuli annotini gracillimi, 1·5 mm. crassi, glabri, lenticellati, hornotini glabri. *Alabastra* minuta, globosa, squamis ciliatis. *Folia* 4–5·5 cm. longa; rhachis glaber; foliola 2-juga, elliptica vel oblongo-elliptica, apice late et inaequaliter emarginata, basi unilateraliter rotundata, 2–3 cm. lata, chartaceo-glabra, reticulata; nervi laterales ascendentes, utrinque prominuli; stipulae deciduae, lineari-lanceolatae, circiter 2 mm. longae, glabrae; stipelae conspicuae, parce ciliatae. *Inflorescentia* spiciformis, circiter 3 cm. longa; axis glaber; bracteae lineares, 3 mm. longae, superne ciliatae; pedicelli graciles, parce pubescentes, 5 mm. longi. *Bracteolae* obovato-oblongae, 7 mm. longae, 3·5 mm. latae, parce pubescentes. *Sepala* nulla. *Tubus staminalis* circiter 2 mm. longus. *Ovarium* stipitatum, parce hirsutum.

Rhodesia : N.W. Rhodesia; Sesheke District, *Miss A. E. Gairdner* 220 !

52. **Brachystegia edulis** *Hutch. et B. Davy*, sp. nov.

*Arbor* magna, patula; ramuli annotini breves, pubescentes, circiter 1·5–2 mm. crassi. *Alabastra* conica, 4–5 mm. longa, pubescentia. *Folia* ad 12 cm. longa; rhachis infra foliola late expansus, glabrescens; foliola 3–5-juga, elliptica vel elliptico-lanceolata, apice obtusa, basi oblique rotundata, inferiora 1·5–2 cm. longa, 1–2·5 cm. lata, terminalia 5–6 cm. longa, 2–2·5 cm. lata, chartacea, glabra et nitida, prominenter nervosa et reticulata; nervi laterales ascendentes; stipulae deciduae; stipelae prominentes. *Inflorescentia* spiciformis, circiter 3 cm. longa; axis glabrescens; pedicelli graciles, 4 mm. longi, pubescentes. *Bracteolae* obovato-oblongae, circiter 5 mm. longae, pubescentes. *Sepalum* 1, lineare, 2 mm. longum, ciliolatum. *Ovarium* breviter stipitatum, parce hirsutum. *Legumen* lignosum, 3·5 cm. latum, glabrum.

KENYA COLONY: Coast districts; a large spreading tree forming open forests on sandy soil, *Battiscombe* 33 ! grows in almost pure sand, *Webber* in *Herb. Battiscombe* 604 ! Shimba Hills (coast), *Battiscombe* 109 !

TANGANYIKA TERRITORY: Nyasa Highlands; Kyimbila, (about 1200 m.) tree with a thick crown, fl. Nov. 1910, *Stolz* 400 !

NYASALAND: Without locality, *Buchanan* 210 !

RHODESIA: N.W. Rhodesia; Highlands of Batoka Country in 1860, *Kirk* (type) ! near Muata Marija, about 1300 m., *Kirk* !

S. RHODESIA: Inyamadzi Valley, about 800 m., a smallish tree, fl. Sep. 8, 1906, *Swynnerton* 1024 !

Timber easily worked, well-marked, not durable (*Battiscombe*).

Bark used for fibre (*Swynnerton*). Seeds eaten; bark fibrous, used for cloth (*Kirk*).

NATIVE NAMES: mRihi (Kidyo), mRiti (Suswahili), mooTsaka (*Swynnerton*), moTondo (*Kirk*).

53. **B. euryophylla** *Harms* in Engl. Bot. Jahrb. 30: 82 (1901).

TANGANYIKA TERRITORY: Usaramo; Ost-Ukami, *Stuhlmann* 8666 (type) !

54. **B. appendiculata** *Benth.* in Trans. Linn. Soc. 25: 313. t. 42 (1866).

NYASALAND: near Zomba and E. end of Lake Shirwa, fl. Oct. 1861, tree 20–40 ft., growing beside water, *Meller* (type) !

*Species Brachystegiae excludendae vel non satis notae.*

Allied to *Brachystegia eurycoma* is an incomplete specimen from Asaba, S. Nigeria (*Leslie* 40 !) which probably represents an undescribed species; it is characterised by its long, linear semi-persistent stipules.

**Berlinia globiflora** *Hutch. et B. Davy*, comb. nov. *Brachystegia globiflora* Benth. in Hook. Ic. Pl. 14: 43 (1881); *Schotia* sp. ? Oliver, Fl. Trop. Afr. 2: 310 (1871).

TANGANYIKA TERRITORY: "Lake Tanganyika" *Cameron* ! Usangu, *Goetze* 1031 ! Without locality, *Busse* 204 !

NYASALAND: Shire Highlands, *Buchanan* 138 (type)! 321! *Adamson* 127! Mt. Mlanje, *Whyte*! Shire River, a good-sized tree, *Kirk*! Tanganyika Plateau, about 650–950 m., fr. July, *Whyte*! Missale, road to Loangwane, a spreading tree 30–35 ft. high, fl. July 1897, *Nicholson*!

PORTUGUESE E. AFRICA: Moçambique Territory; Madanda Forest at Amcate, *Swynnerton* 1025! Mossurizi, in woods between Chidoco and Mazani, fl. Feb. 1907, *W. H. Johnson* 106! *Lawrence* in *herb. Swynnerton* 165!

RHODESIA: S. Rhodesia; Melsetter District, common on poor shaly or sandy ground in the open woods near Chirinda, *Swynnerton* 6506! Umtali Div.; Odzani River Valley, *Teague* 80! Salisbury District, about 1600 m., fl. Jan. 1918, *Eyles* 913! *Marshall!* Cleveland Dam, a large tree, common about 1660 m., fl. Feb. 1917, *Eyles* 664! Growing in company with *Brachystegia Randii*, *Rand* 1407! Without locality *Monro* 970! N.W. Rhodesia; Batoka Highlands, fr. July 1860, *Kirk*!

BELGIAN CONGO: open grass flats on the Lukifwa River, *Kassner* 2852!

NATIVE NAMES: mNondo (*Eyles*, *Monro*), Mutondo (*Swynnerton*), mSaasa (*Marshall*).

Kirk states that in the Batoka Highlands the bark is fibrous and used for making cloth.

## REFERENCES.

(1) Sim, T. R., The Forest Flora and Forest Resources of Portuguese East Africa; 1909.

(2) Burtt Davy, J. Brachystegia Bark-cloth, in Transvaal Agricultural Journal 5: 459 (1907).

(3) Roscoe, The Rev. John; The Soul of Central Africa, pp. 169–171.

(4) According to Dawe, *Ficus natalensis* Hochst., of which the vernacular name is *Sango*, is reputed to yield the best bark-cloth of Uganda, sold amongst the natives at R 2 per piece (Hutchinson, in Fl. Trop. Afr. 6: sect. 2, 208).

(5) Grant reports *Dalbergia melanoxylon* Guill. & Perr. as being used for this purpose.

(6) Roscoe, The Rev. John; Twenty-five years in East Africa: pp. 99, 182, 221; plates III & XIV, Cambridge University Press (1921).

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# XIV.—CONTRIBUTIONS TO THE FLORA OF SINALOA: II.*

L. A. M. RILEY.

### LINACEAE.

**Linum Cruciata** *Planch.*; SBH. 275.
Sierra Madre, *Seemann* 2166.

### MALPIGHIACEAE.

**Byrsonima crassifolia** (*L.*) *DC.*; CNH. v. 217; Zoe, v. 204: N. Am. Fl. xxv. 168.—*B. cotinifolia* H.B.K.; S B H. 273.

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* Continued from *K.B.* 1923, p. 115.

Colomas, *Rose* 1807; Cerro Colorado, *Brandegee;* Cerro de Pinal, *Seemann* 1520. San Ignacio: Arroyo de Tacuitapa, 280 m. *Gonzalez* 349.

Vernacular name "Nanche."

Niedenzu treats *B. crassifolia* and *B. cotinifolia* as separate species, but states that transitional forms occur (De Genere Byrsonima, ii. 19, adnot.)

**Malpighia umbellata** *Rose* in CNH. i. 310, t. 29 (1895); Zoe v. 204; N. Am. Fl. xxv. 156.

Agiabampo, *Palmer* 799; Culiacan, *Brandegee.*

Vernacular name "Mora de Campo."

**Thryallis angustifolia** (*Benth.*) *Kuntze;* CNH. xii. 280; N. Am. Fl. xxv. 152.

"The common species of the west coast of Mexico" (Rose).

**T. dasycarpa** *Small* in N. Am. Fl. xxv. 151 (1910).

Rosario, *Lamb* 470.

**T. glauca** (*Cav.*) *Kuntze;* N. Am. Fl. xxv. 150.—*Galphimia glauca* Cav.; SBH. 274.

Santa Lucia, *Seemann* 2149; without locality, *Gonzalez* 1085.

Vernacular name "Hierba del Venado."

**T. Palmeri** *Rose* in CNH. xii. 281; N. Am. Fl. xxv. 151.—*Galphimia glandulosa* Rose in CNH. v. 137 (1897), non Cav.

San Ignacio; Pueblo del Limon, 280 m., *Gonzalez* 140.

Vernacular name "San Vicente."

I have not seen the type of *T. Palmeri*, and have identified Gonzalez' plant from Rose's and Small's descriptions.

**T. tuberculata** *Rose* in CNH. xii. 281 (1909).

Between Rosario and Colomas, *Rose* 1607.

**T. vestita** (*S. Wats.*) *Rose;* CNH. xii. 281; N. Am. Fl. xxv. 152.—*Galphimia vestita* S. Wats.; Zoe v. 204.

Cofradia, *Brandegee.*

**Echinopterys eglandulosa** (*A. Juss.*) *Small;* N. Am. Fl. xxv. 148.—*E. Lappula* A. Juss.; SBH. 274.

Sierra Madre, *Seemann* 2151. Cosala: Conitaca, 130 m. *Gonzalez* 821.

**Banisteria arborescens** (*Brandegee*) *Small;* N. Am. Fl. xxv. 135.—*Heteropterys arborescens* Brandegee in Zoe v. 203 (1905).

Cerro Colorado, *Brandegee.*

**B. laurifolia** *L.;* N. Am. Fl. xxv. 137.—*Heteropterys laurifolia* Juss. *H. floribunda* H. B. K.

San Ignacio: Arroyo de los Arrayanes, 320 m., *Gonzalez* 354.

**B. Palmeri** (*Rose*) *C. B. Robinson;* N. Am. Fl. xxv. 135.—*Heteropteris Palmeri* Rose.

San Ignacio: Aguaje de Barrabas, 95 m., *Gonzalez* 641; Falda del C. del Perico, 450 m., *Gonzalez* 536.

Vernacular name "Bejuco Huesillo."

I have not seen the type of *B. Palmeri*; numbers 536 and 641 were so determined at Washington according to Señor Gonzalez.

**Mascagnia macroptera** (*Moc. et Sessé*) var. **flabellariicarpa** *Niedenzu*, De Gen. Mascagnia, 27 (1908).

Villa Union, *Lamb* 397. San Ignacio: R. de los de Ponce, 260 m., *Gonzalez* 130.

Vernacular name "Mata-nene."

Niedenzu regarded *M. macroptera* (with two varieties *flabellariicarpa* and *Jussieuana*) and *M. septentrionalis* as independent species. Small, on the other hand, treated *M. septentrionalis* as a synonym of *M. macroptera*, and recognized no varieties. The varieties *flabellariicarpa* and *Jussieuana* seem, however, to be specifically distinct. The former is apparently confined to northwestern Mexico and the latter to eastern Mexico.

**Gaudichaudia mucronata** (*Moc. et Sessé*) *A. Juss.*; N. Am. Fl. xxv. 130.—*Hiraea mucronata* Moc. et Sessé. *Gaudichaudia filipendula* A. Juss.; Zoe v. 203.

Culiacan and Cofradia, *Brandegee*.

**Janusia mexicana** *Brandegee* in Zoe v. 203.

Cerro Colorado and Culiacan, *Brandegee*.

## Zygophyllaceae.

**Kallstroemia californica** (*S. Wats.*) *Vail*; Rydberg in N. Am. Fl. xxv. 112.—*Tribulus californicus* S. Wats.

Sinaloa (fide Rydberg).

**K. canescens** *Rydberg*, l.c. 113 (1910).

Rosario, *Rose* 1547.

**K. grandiflora** *Torr.*; Rydberg, l.c. 114.—*Tribulus grandiflorus* Benth. et Hook. f.; CNH. i. 312.

Agiabampo, *Palmer* 1110.

**K. longipes** *Rydberg*, l.c.

Rosario, *Rose* 1829.

**K. maxima** (*L.*) *Torr. et Gray*; Rydberg, l.c. 111.—*Tribulus maximus* L.; CNH. i. 312.

Agiabampo, *Palmer* 786.

**Guaiacum Coulteri** *A. Gray*; Rydberg, l.c. 107; Fedde Rep. xiv. 106.

San Ignacio: R. de Piedras de Lumbre, 50 m. *Gonzalez* 145. Coast-region near Topolobampo in open woods on the Becerros estate, *Endlich* 709.

Vernacular name "Guayacan."

## Geraniaceae.

**Geranium Hernandesii** *DC.*; Moc. et Sessé Ic. Ined. t. 147.—*G. carolinianum* Seem. Bot. Herald, 274, non L.

Colder parts of the Sierra Madre, *Seemann* 2165.

Seemann's plant from the Western Sierra Madre has a denser indumentum, leaves with a greater tendency to be quinquepartite, and sepals with distinctly shorter apiculi than the specimens from Mexico, San Luis Potosi and Oaxaca referred to *G. Hernandesii* by Peyritsch (Linnaea, xxx. 65), S. Watson (Proc. Am. Acad. xxvii. 334) and Knuth (Engl. Pflanzenreich, Geran. 193). In all these respects it agrees more closely with Mociño and Sessé's figure of *G. Hernandesii*.

## Oxalidaceae.

**Oxalis lanceolata** (*Small*) *Riley*, comb. nov.—*Ionoxalis lanceolata* Small in N. Am. Fl. xxv. 35 (1907); CNH. xiii. 304.

Colomas, *Rose* 1651.

**O. primavera** (*Rose*) *Riley*, comb. nov.—*Ionoxalis primavera* Rose in CNH. x. 114 (1906); N. Am. Fl. xxv. 44.

"Very common in the lowlands of Tepic and Sinaloa" (Rose).

**O. sepium** *St. Hil.*—*Lotoxalis dichotoma* Rose in CNH. x. 115 (1906). *L. sepium* Small in N. Am. Fl. xxv. 48.

Foothills of the Sierra Madre near Colomas, *Rose* 1650.

**O. Trientalis** (*Small*) *Riley*, comb. nov.—*Ionoxalis Trientalis* Small in N. Am. Fl. xxv. 35 (1907); CNH. xiii. 306.

Near Colomas, *Rose* 3217.

**O. yucatanensis** (*Rose*) *Riley*, comb. nov.—*Lotoxalis yucatanensis* Rose in CNH. x. 116 (1906). *L. occidentalis* Rose, l.c. 115; N. Am. Fl. xxv. 48.

On the road between Rosario and Concepción, *Rose* 3265.

## Rutaceae.

**Xanthoxylum arborescens** *Rose* in CNH. v. 112 (1897); Zoe v. 204; N. Am. Fl. xxv. 195.

Along river banks and in arroyos, Ymala, *Palmer* 1454, 1455, 1405a; Culiacan and Cofradia, *Brandegee*.

**X. Fagara** (*L.*) *Sargent;* N. Am. Fl. xxv. 190.—*X. Pterota* H.B.K.; CNH. v. 112, 164; Zoe v. 204.

Ymala, *Palmer* 1424; Rosario, *Rose* 1586; Culiacan, *Brandegee*.

**X. Goldmani** *Rose* in N. Am. Fl. xxv. 195 (1911).

On the road from Culiacan to Las Flechas, *Goldman* 311.

**X. occidentale** *Rose* in CNH. v. 164 (1899).—*X. caribaeum* P. Wilson in N. Am. Fl. xxv. 193, partim, non Lam.

Rosario, *Rose* 1820; Sinaloa without locality, *Gonzalez* 673. Vernacular name "Zorrillo."

*X. occidentale* is treated by P. Wilson, l.c., as a synonym of *X. caribaeum* Lam. which appears to be confined to the West Indies and the northern littoral of South America. It differs from the latter in the smaller leaflets with about twice as many and more convex crenae, and in the non-suberose sepals.

**Esenbeckia Hartmanii,** *Robinson et Fernald* in PAA. xxx. 115 (1894); CNH. v. 111; N. Am. Fl. xxv. 200.

Culiacan, *Palmer* 1801.

**Casimiroa edulis** *La Llave et Lex.;* SBH. 273; CNH. v. 165, 217; N. Am. Fl. xxv. 214; Popenoe, Man. Trop. Fruits, 445.

Frequent in the states of Sinaloa and Durango, both wild and cultivated, *Seemann* 2137; Mazatlan, *Rose* 3105. San Ignacio: Arroyo de Chinacates, 80 m. *Gonzalez* 166.

Vernacular names "Zapote blanco" "Zapote dormilon."

**Citrus medica** *L.;* Kew Bull. 1894, 177; Kew Bull. Add. Ser. ix. 131; CNH. v. 165; N. Am. Fl. xxv. 222.

Near Colomas, *Rose* 1740. "A small tree in the foothills growing as an escape."

## Simarubaceae.

**Alvaradoa amorphoides** *Liebm.;* N. Am. Fl. xxv. 239; Fedde Rep. xiv. 107.

San Ignacio: El Bado hondo, 400 m. *Gonzalez* 770. Choix: in woods between Hornillo and Choix, 100 m., *Endlich* 729.

Vernacular names "Pié de Gallo" (Gonzalez), "Añil negro" (Endlich).

## Ochnaceae.

**Ouratea** sp.

Escuinapa: Cerrito del Fuerte, 30 m., *Gonzalez* 1134.

Vernacular name "Palo Chino."

Gonzalez' material is insufficient for description. With the exception of a specimen from Acapulco (*Palmer* 412) I have no other records of the genus from Western Mexico.

## Burseraceae. F139

**Bursera arborea** (*Rose*) *Riley*, comb. nov.—*Terebinthus arborea* Rose in CNH. x. 118 (1906). *Elaphrium arboreum* Rose in N. Am. Fl. xxv. 247.

Near Rosario, *Rose* 1821; between Rosario and Concepcion, *Rose* 3259a, 3259b, 3259e.

**B. attenuata** (*Rose*) *Riley*, comb. nov.—*Terebinthus attenuata* Rose in CNH xii. 278 (1909). *Elaphrium attenuatum* Rose in N. Am. Fl. xxv. 247.

Near Colomas, *Rose* 3213.

**B. bipinnata** (*DC*) *Engler;* Zoe v. 204.—*Elaphrium bipinnatum* Schlecht.; N. Am. Fl. xxv. 249. *Terebinthus bipinnata* W. F. Wight; CNH. x. 119.

Cerro Colorado, *Brandegee.*

**B. collina** *Brandegee* in Zoe v. 204 (1905).—*Elaphrium collinum* Rose in N. Am. Fl. xxv. 248.

Cofradia, *Brandegee.*

**B. laxiflora** *S. Wats.;* CNH. i. 313; Zoe v. 204; Fedde, Rep. xii. 224. *Terebinthus laxiflora* Rose; CNH. xii. 279. *Elaphrium laxiflorum* Rose in N. Am. Fl. xxv. 253.

Agiabampo, *Palmer* 797; Culiacan, *Brandegee;* between Choix and the upper Rio de Fuerte, 300–400 m., *Endlich* 786.

Vernacular name "Copal."

The resin mixed with hog's lard is used in the form of a poultice as a remedy for headache.

**Bursera lonchophylla** *Sprague et Riley*, sp. nov.; species nullae hucusque descriptae arcte affinis, a *B. odorata* Brandegee foliis 2–3-plo longioribus, foliolis anguste lanceolatis, drupa ovoidea valde cuspidata recedit.

*Ramuli* graciles, 2 mm. diametro 10 cm. infra apices, cinereo-fusci, glabri, hornotini sulcati, annotini subteretes, minutissime nigro-punctati. *Folia* pinnata, 3–5-juga, 5·5–7·5 cm. longa; rhachis gracilis, praeter internodium supremum leviter alatum aptera; internodia rhacheos 8–9 mm. longa; petioli 1·3–2 cm. longi; foliola sessilia vel brevissime petiolulata, anguste lanceolata, longe obtuse acuminata, in basin breviter angustata, inferiora minora 7–10 mm. longa, 2–3·5 mm. lata, superiora usque ad 2·7 cm. longa et 6 mm. lata, integra, tenuiter coriacea, glabra, opaca, supra costa conspicua, nervis lateralibus sub lente manifestis, subtus costa nigrescente conspicua rete venularum laxo. *Pedunculi* solitarii, uniflori, circiter 5 mm. longi, recurvi, vel biflori, 4 mm. longi, pedicellis 3 mm. longis. *Drupa* trivalvis, trigono-ovoidea, valde cuspidata, 8 mm. longa, 4·5 mm. diametro, nigra, rugulosa, glabra. *Pyrena* trigona, 5–6 mm. longa arillodio incluso, basi truncata, praeter aream basalem deltoideam arillodio ubique obtecta.

Sinaloa: Choix; Cerro del Muerto, 620 m., *Gonzalez* 896 (type in Herb. Kew.).

Vernacular names "Torote," "Chutama."

**B. occidentalis** (*Rose*) *Riley*, comb. nov.—*Elaphrium occidentale* Rose in N. Am. Fl. xxv. 246 (1911).

Between Rosario and Concepcion, *Rose* 3259 d.

**B. Palmeri** *S. Wats.;* Zoe v. 204.—*Terebinthus Palmeri* Rose in CNH. x. 121. *Elaphrium Palmeri* Rose in N. Am. Fl. xxv. 255.

Culiacan, *Brandegee.*

**B. pilosa** (*Engler*), *Riley*, comb. nov.—*B. graveolens* var. *pilosa* Engler in DC. Monogr. Phan. iv. 49 (1883). *Terebinthus pilosa* Rose in CNH. xii. 279. *Elaphrium pilosum* Rose in N. Am. Fl. xxv. 251.

"Southern Chihuahua and Sinaloa to Colima" (Rose).

**B. rubra** (*Rose*) *Riley*, comb. nov.—*Terebinthus rubra* Rose in CNH. x. 121 (1906). *Elaphrium rubrum* Rose in N. Am. Fl. xxv. 252.

Near Colomas, *Rose* 1670.

**Bursera stenophylla** *Sprague et Riley*, sp. nov.; affinis *B. bipinnatae* Engler, foliis laxius bipinnatis infructescentias duplo excedentibus, internodiis rhacheos longioribus, foliolis longis angustis ob internodia elongata pinnarum remotis, arillodio pyrenam circiter $\frac{1}{2}$–$\frac{2}{3}$ tegente facile distinguenda.

*Ramuli* satis graciles, vix ultra 2 mm. diametro 10 cm. infra apices, cinereo-fusci, costulati, hornotini angulati, minute pubescentes, annotini glabrati. *Folia* 5·5–13 cm. longa, bipinnata, nodis rhacheos 7–11, quorum superiores 3 (rarius 2–4) foliola solitaria sessilia, reliqui pinnas 1–6-jugas praeter nonnullas unifoliolatas ferunt; rhachis minute pilosa; rhachillae internodia ut rhacheos internodia superiora anguste alata: foliola lateralia pinnarum elliptico-vel-obovato-oblonga, apice obtussima, in basin ± oblique angustata, 3–7 mm. longa, 1·2–2·5 mm. lata, tenuiter coriacea vel chartacea, glabra, margine tandem ± revoluta, supra opaca rete venarum inconspicuo, subtus costa prominente rete distincto leviter impresso; foliola terminalia oblanceolato-linearia, 7–13 mm. longa, 1·5–2 mm. lata. *Infructescentia* rhachi 2–2·5 cm. longa sulcata minute pilosa. *Drupa* bivalvis, ellipsoidea, apiculata, 8–9 mm. longa, 5 mm. diametro, striata, glabra. *Pyrena* compresso-ovoidea, acuta, 5–6 mm. longa, 4–4·5 mm. lata, $\frac{1}{2}$–$\frac{2}{3}$ tantum arillodio obtecta.—*B. bipinnata* S. Wats. in Proc. Am. Acad. xxi. 421 (1886), non Engl.

South-western Chihuahua: Hacienda San Miguel, *Palmer* 200 (type in Herb. Kew.). Sinaloa: Choix, Las Jicaras, 500 m., *Gonzalez* 894.

Vernacular names "Jaboncillo" (Chihuahua) "Palo Copal" (Sinaloa).

According to Palmer, *B. stenophylla* is a "copal-varnish tree," 10 ft. high and 2–6 in. in diameter, with short compact branches and very brittle wood. The nut is black, and is covered below with a fleshy orange-coloured pulp (the aril-like mesocarp).

**B. tenuifolia** *Rose* in CNH. iii. 314 (1895); Zoe v. 204 ("*Bursera tenuiflora* Rose").—*Terebinthus tenuifolia* Rose in CNH. x. 122. *Elaphrium tenuifolium* Rose in Am. Fl. xxv. 252.

Lodiego, *Palmer* 1581; Culiacan, *Brandegee*.

**B.** sp.

San Ignacio: Rancho del Zapote, 540 m., *Gonzalez* 413. Vernacular name "Copalillo."

Possibly a form of *B. acutidens* Sprague et Riley (*see* below), but the specimen is without fruit and cannot be determined with certainty. The leaves are less pilose, and the leaflets more coarsely toothed than in the type of *B. acutidens*.

[Descriptions of two new Mexican species of *Bursera* are appended.

**Bursera acutidens** *Sprague et Riley*, sp. nov.; affinis *B. Palmeri* S. Wats., foliolis planis tenuioribus, subtus grosse pubescentibus nec tomentosis, rhacheos alis acute dentatis, drupa obtusiore magis pilosa, pyrena subglobosa haud alata distinguenda.

*Rami* flexuosi, crassi, striati, circiter 5 mm. diametro 10 cm. infra apices, juventute fulvo-velutini, demum grosse pubescentes, cinerei. *Folia* 14–17 cm. longa, 9·5–11·5 cm. lata, pinnata, 3-juga; petioli 3–4·5 cm. longi, hirsuti; rhacheos internodia 2·5–3 cm. longa, alata, alarum superficie lineari-oblanceolata acute dentata dentibus depresso-deltoideis; foliola elliptico-oblonga vel inferiora ovata, apice acuta, basi subcuneata, 3·5–7 cm. longa, 2·2–3·5 cm. lata, grosse subdupliciter serrata, chartacea, plana, supra aspere, subtus densius pubescentia. *Infructescentiae* 1·5–2·5 cm. longae; rhachis angulata, dense hirsuta; pedicelli 2–3 mm. longi. *Drupa* 2-valvis, ovoidea, 8–10 mm. longa, rugosa, pilosa. *Pyrena* arillodio tenui obtecta, subglobosa, 5·5 mm. diametro, fulva, concolor vel superne bimaculata maculis nigriusculis.

Colima: Manzanillo, *Palmer* 987 (type in herb. Kew.). The specific name is given in allusion to the sharply-toothed wings of the leaf-rhachis.

**Bursera sphaerocarpa** *Sprague et Riley*, sp.nov.; affinis *B. Palmeri* S. Wats., a qua foliolis non rugosis, infructescentiis longioribus, drupa majore subglobosa, pyrena lenticulari recedit.

*Rami* flexuosi, crassi, striati, 6 mm. diametro 10 cm. infra apices, juventute fulvo-velutini, tandem glabrati, cinerei. *Folia* 10–15 cm. longa, 8–10 cm. lata, pinnata, 4–5-juga; petioli 2–3·5 cm. longi, sparse velutini; rhacheos internodia 1–2 cm. longa, late alata, alarum superficie oblanceolata grosse crenata; foliola ovato-oblonga, apice acuta vel breviter acute acuminata, basi oblique rotundata, 3·5–5·5 cm. longa, 1·5–2·8 cm. lata, grosse subdupliciter crenato-serrata, subcoriacea, plana, supra aspere velutino-pubescentia, subtus tomentosa. *Infructescentiae* 2–5 cm. longae; rhachis angulata, crispule hirsuta; pedicelli 2–3 mm. longi. *Drupa* bivalvis, subglobosa, fere 1 cm. diametro, non apiculata, rugosa, nitidula. glabra. *Pyrena* arillodio omnino obtecta, crasse lenticularia, 6·5 mm. diametro, infra medium anguste alata, glanduloso-tuberculata, fulva, hilo parvo, area parva apicali pallidiore, dimidio altero circulo impresso 5–5·5 mm. diametro notato (signo externo loculi abortivi).

Guerrero: Acapulco, *Palmer* 432 (type in herb. Kew.).]

## Meliaceae.

**Trichilia colimana** *C. DC.* (?); Zoe v. 204.

Culiacan, *Brandegee* (ex op. cit.).

**T. havanensis** var. **spatulata** *Rose* in CNH. i. 314 (1895).

San Ignacio: La Estancia, 40 m., *Gonzalez* 190.

Vernacular names "Canache" (Sinaloa), "Garrapatilla" (Colima).

**Cedrela occidentalis** *C. DC. et Rose* in CNH. v. 190 (1899).

Choix: Tasajera, 440 m., *Gonzalez* 899.

Vernacular names "Cedro," "Spanish Cedar."

## Olacaceae.

**Ximenia parviflora** *Benth.;* SBH. 345; CNH. xxiii. 237.
Sierra Madre, *Seemann* 2156; Sinaloa (fide Standley).

**Schoepfia parvifolia** *Planch.*; CNH. xxiii. 238.
Sinaloa (fide Standley).
Vernacular names "Tecolotillo," "Palo fierro."

## Celastraceae.

**Maytenus phyllanthoides** *Benth.;* Fedde, Rep. viii. 291.
Coast-region near Topolobampo, at the Hacienda Correrepe, *Endlich* 693.
Vernacular names "Aguabola," "Mangle aguabola."
The leaves are used as a remedy for scurvy and toothache.

**Wimmeria confusa** *Hemsl.* Diagn. Pl. Nov. i. 6 (July, 1878); Biol. i. 192; CNH. v. 129; Fedde Rep. viii. 293.—*W. pallida* Radlk. in Sitzb. Bayer. Akad. 1878, 379 (Ueber Sapindus etc.), as to *Hartweg* 41.
Lodiego, *Palmer* 1598; woods near Choix, 100 m., *Endlich* 722. San Ignacio: Cerro de Perico, 680 m., *Gonzalez* 541.
Vernacular name "Algodoncillo."
Radlkofer based *Wimmeria pallida* on flowering material collected by Hartweg, and fruiting specimens collected by Haenke and Liebmann. Rose (CNH. v. 130) considers that the fruiting specimens represent a different species, to which he applies the name *W. pallida* Radlk. emend.

## Hippocrateaceae.

**Hippocratea mexicana** *Miers;* Zoe v. 209.
Cerro Colorado, *Brandegee.*

**H. pauciflora** *Rose* in CNH. v. 197 (1899).
Near Rosario, *Rose* 1587.

**H. utilis** *Rose*, l.c.
Near Colomas, in the foothills of the Sierra Madre, *Rose* 1706.
Vernacular name "Bejuco Colorado."

## Rhamnaceae.

**Zizyphus Endlichii** *Loes.* in Fedde, Rep. viii. 296 (1910).
Open woods in the coast-region near Topolobampo, *Endlich* 696.
Vernacular names "Nanche," "Ceituna."
The fruits are edible, and the bark is used as a remedy for toothache.

**Z. sonorensis** *S. Wats.*; Zoe v. 210.
Altata, *Brandegee.* San Ignacio: Los Chinacates, 90 m. *Gonzalez* 160.
Vernacular name "Nanche de la Costa."

**Condalia obovata** *Hook.* var. **angustifolia** *Loes.* in Fedde, Rep. viii. 297 (1910).

Coast-region near Topolobampo, in woods at the Hacienda Correrepe, *Endlich* 673.

Vernacular name "Mezquitillo."

A paste prepared from the white wood-ash is used by carpenters for scribing timber.

**Karwinskia glandulosa** *Zucc.* Pl. Nov. fasc. 1, 351, t. 16 (Abh. Akad. München, i.; 1832).

Choix; Tasajera, 440 m., *Gonzalez* 879.

Vernacular name "Cacachila cina."

Trelease (Syn. Fl. N. Am. i. part 1, 405) unites the above species with *K. Humboldtiana* Zucc., from which, however, it appears distinct on account of the smaller oblong-elliptic leaves with more numerous glands, and the long acuminate sepals.

**K. Humboldtiana** *Zucc.* Pl. Nov. fasc. 1, 353 (Abh. Akad. München, i.; 1832); Syn. Fl. N. Am. i. part 1, 405; CNH. v. 229; Fedde, Rep. viii. 297.—*Rhamnus Humboldtianus* Roem. et Schult.; H.B.K. Nov. Gen. vii. 52, t. 618.

Colomas, *Rose;* coast-region near Topolobampo, in open woods at the Hacienda Correrepe, *Endlich*. San Ignacio: near town of San Ignacio, 150 m., *Gonzalez* 422.

Vernacular names "Margarita," "Frutillo," "Negrito," "Capulincillo," "Capulin cimarron," "Coyotillo," "Tullidor," "Tullidora," "Cacachila."

The fruit is used as a remedy for tetanus. When eaten in excess by men or domestic animals it produces convulsive movements in the joints. The leaves are used with salt as a febrifuge, and also possess cathartic properties.

**K. parvifolia** *Rose* in CNH. i. 315, t. 31 (1895).

Agiabampo, *Palmer* 773.

**Rhamnus dianthes** *Riley*, sp. nov.; nullis speciebus mexicanis hucusque descriptis affinis, ramulis tomentosis, foliis breviter petiolatis elliptico- vel ovato-oblongis apiculatis discoloribus, supra velutinis nervis impressis, subtus tomentellis nervis valde prominentibus, margine reflexo, floribus in axillis geminatis, facile cognoscitur.

*Rami* nodulosi, circiter 3 mm. diametro 2 dm. infra apices, hornotini fulvo-tomentosi, annotini fuscescentes. *Folia* breviter petiolata, elliptico- vel ovato-oblonga, apiculata, basi rotundata vel obtusa, 2–4·5 cm. longa, 1–2 cm. lata, integra, margine reflexo, coriacea, discolora, supra breviter velutina, nervis impressis, subtus pallide tomentella, nervis valde prominentibus, rete venularum prominente; nervi laterales obliqui, paralleli, utrinsecus 6–8; petioli 2–4 mm. longi, tomentosi; stipulae subulatae, diu persistentes. *Flores* in axillis gemini; pedicelli sub fructu 5–6 mm. longi, deflexo-arcuati, tomentelli. *Calycis tubus* 1 mm. longus; lobi deltoidei, acuti, 1·7–1·8 mm. longi, basi 1·5 mm. lati. *Petala* 1·2 mm. longa, apice emarginato sinu 0·3 mm. alto. *Filamenta* e basi deltoidea angustata, 0·7 mm. longa;

antherae 0·5–0·6 mm. longae. *Drupa* subglobosa, circiter 5 mm. diametro, stylo persistente 1 mm. longo coronata. *Pyrenae* compresso-ellipsoideae, 4·5 mm. longae, 3 mm. crassae. —*R. tomentellus* Seem. Bot. Herald, 275 (1856), non Benth. *R. californicus* Hemsl. Biol. 197 (1880), non Eschsch.

Sierra Madre, *Seemann* 2155 (type in Herb. Kew.).

**Rhamnus Gonzalezii** *Riley*, sp. nov.; affinis *R. spinoso* Hemsl. foliis minoribus pro rata angustioribus subtus hirsutioribus, pedicellis brevibus robustis hirsutissimis distinguitur.

*Rami* et ramuli rigidi, leviter flexuosi, sulcati, valde lenticellati, cinerei, ferrugineo-hirsuti, tandem glabrati; rami 30 cm. infra apices 3·5 mm. diametientes; ramuli patuli, 7–10 cm. longi. *Folia* alterna, petiolata, elliptica vel rhomboideo-elliptica, apice emarginata, longe mucronata, 3–4·5 cm. longa, 1·5–2·5 cm. lata (rarius ad 7 cm. longa et 3·5 cm. lata), integra, supra opaca, glabrata, subtus costa nervisque hirsutis ceterum sparse hirsuta vel glabrescentia; petioli 5–7 mm. longi, ferrugineo-hirsuti; stipulae spinescentes, circiter 4 mm. longae, glabrescentes. *Flores* in axillis fasciculati, pedicellis robustis 2–3 mm. longis dense ferrugineo-hirsutis, pilis ascendentibus. *Calycis tubus* 0·75 mm. longus, hirsutissimus; lobi ovato-triangulares, obtusi, 1·25 mm. longi, basi 1 mm. lati, glabrescentes. *Petala* cucullata, breviter unguiculata, 1 mm. longa, glabra. *Filamenta* 1 mm. longa, ad basin sensim dilatata, glabra. *Stylus* 1 mm. longus, trifidus, glaber. *Fructus* non visus.

Sinaloa: San Ignacio; Cerro de la Nanche, San Agustin, 205 m. *Gonzalez* 628 (type in Herb. Kew.).

Vernacular name "Aleznillo."

**Ceanothus buxifolius** *Willd.* ex Roem. et Schultes, Syst. v. 300; H.B.K. Nov. Gen. vii. 62, t. 615; SBH. 276; Hemsl. Biol. i. 199 (excl. *Parry et Palmer* 122).

Sierra Madre, in forests, *Seemann* 2158.

**C. caeruleus** *Lag.* Gen. et Sp. 11 (1816); Lodd. Bot. Cab. t. 110; Roem. et Schultes, Syst. v. 298; H.B.K. Nov. Gen. vii. 63; Hemsl., Biol. i. 199.—*C. azureus* Desf. Tabl. ed. 2, 232 (1815), nomen nudum; J. B. Ker, Bot. Reg. iv. t. 291 (1818), descr.; DC Prodr. ii. 31; Brongn. Mem. Rhamn. 77, t. 4, fig. 4 (Ann. Sc. Nat. x. 384, t. 15, fig. 4; 1827); SBH. 276; Hemsl. Biol. i. 199. *C. bicolor* Willd. ex Roem. et Schultes, Syst. v. 300 (1819).

Sierra Madre, *Seemann* 2157, and without number.

The earliest name proposed for the species was *C. azureus* Desf., which was published as a "nomen nudum" in 1815, and was not validated by description until 1818. As the name *C. caeruleus* Lag. was published with a description in 1816, it should be adopted under International Rules.

Rose treats *Pringle* 11395 (Federal District, near Eslava) and *Bourgeau* 994 (San Nicolas) as a new species, *C. Candolleanus*, to which he refers *C. azureus* DC. as a synonym (Contrib. U.S.

Nat. Herb. xii. 283). He does not state how *C. Candolleanus* differs from *C. azureus* Desf., but seems to have separated it on account of the pedicels, which are glabrous as described by De Candolle. Ker, on the other hand, described *C. azureus* as having pilose pedicels. This character, however, seems to be variable. There are in the Kew Herbarium two specimens of *C. azureus* cultivated at Paris in 1816 (Herb. J. Gay); one has glabrous pedicels, the other densely pilose pedicels, but in other respects they are similar.

The material from Western Mexico has fewer-flowered inflorescences and smaller leaves than typical *C. caeruleus*, and may eventually have to be separated. *C. parvifolius* (S. Wats.) Rose, from Chihuahua, is undoubtedly distinct.

**Cormonema Nelsoni** *Rose* in CNH. iii. 315 (1895).

Lodiego, *Palmer* 1625.

**Colubrina mexicana** *Rose*, l.c.

Culiacan, *Palmer* 1526.

**Gouania mexicana** *Rose*, l.c. 314.

Culiacan, *Palmer* 1491; Ymala, *Palmer* 1694.

### Vitaceae.

**Ampelopsis mexicana** *Rose* in CNH. viii. 51 (1903).

Near Rosario, *Rose* 1579.

**Cissus rhombifolia** *Vahl.*; Planch. in DC. Monogr. v. 107.—*Vitis rhombifolia* Baker.

Near Colomas, *Rose* 1697 (Hb. Kew.).

**C. trifoliata** *L.*; Urb. Symb. Antill. iv. 380; viii. 404.—*C. acida* L.; Planch. in DC. Monogr. v. 534.

Agiabampo, *Palmer* 784 (Hb. Kew.).

### Sapindaceae.

**Serjania rutaefolia** *Radlk.* in CNH. i. 316 (1895).

Agiambampo, *Palmer* 795.

**Serjania** sp.?

Cosalá: C. del Platano at Conitaca, 150 m. *Gonzalez* 826. The flowers are too immature for accurate determination.

[**Cardiospermum Halicacabum** L.; Kew Bull. Add. Ser. ix. 165.

Widely distributed throughout the subtropical and tropical regions of the world and doubtless occurs in Sinaloa.]

**Paullinia fuscescens** *H.B.K.*: Radlk. Monogr. 209.—*P. velutina* DC.

Cosalá: Conitaca, 280 m., *Gonzalez* 798.

Vernacular name "Bejuco Costillón."

**Sapindus Saponaria** *L.*; Desc. Fl. Ant. iv. 121, t. 261; Radlk. in Mart. Fl. Bras. xiii. pars. 3, 512, t. 109; Sarg. Silv. ii. 68, 69, tt. 74, 75; CNH. v. 236.

San Ignacio : Laguna Seca, 40 m. *Gonzalez* 200.
Vernacular name " Boliche."

**Dodonaea viscosa** *L.*; SBH. 274; Radlk. in Mart. Fl. Bras. xiii. pars. 3, 639.
Sierra Madre, *Seemann* 2152.

ANACARDIACEAE. F153

**Rhus** sp.
San Ignacio, 700 m. *Gonzalez* 832. Apparently a new species related to *R. Palmeri* Rose, but the material is insufficient for description.

**Comocladia macrophylla** (*Hook. et Arn.*) *Riley*, comb. nov.—*Rhus macrophylla* Hook. et Arn. Bot. Beech. Voy. ii. 213 (1840–41); Engler in DC. Monogr. iv. 403.
Without precise locality, *Gonzalez* 1075.
Vernacular name " Hincha huevos."
The type specimen was collected at Acapulco. Gonzalez' specimen (a single leaf) is more pilose, but this is probably a question of age.

**Mangifera indica** *L.*; Kew Bull. Add. Ser. ix. 169; Popenoe, Man. Trop. Fruits, 81, tt. 5, 6; Burns and Prayag, The Book of the Mango (1921).
Rosario : Rancho Zapato, 1020 m., *Gonzalez* 1164.
Vernacular name " Mango."

**Spondias mexicana** *S. Wats.* in PAA. xxii. 403 (1887); CNH. v. 219.
" In 1887 Dr. S. Watson described from Tequila, State of Jalisco, a yellow-fruited form under the name of *S. mexicana* which appears to be the ' ciruela amarilla,' cultivated and sold on the west coast as far north as Guaymas " (Rose).

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## XV.—MISCELLANEOUS NOTES.

**Buttresses.**—Since the publication of a note on " Buttresses as an Assistance to Identification " (*K.B.* 1922, p. 265), a copy has been received of Mr. W. D. Francis' pamphlet " Some Characteristics of Queensland Rain Forests and Rain-Forest Trees,"* in which the general characteristics of the principal forest trees of Queensland are recorded in a manner which enables a worker in the field to arrive at their approximate identification. Except in the case of the carribin (*Sloanea Woolsii*) where the buttresses are recorded as curving outwards (compare *Cynometra* sp. *K.B.* 1922, p. 268) the proportion of the various sides of the buttress and the behaviour of the outer edge is not specifically referred to.

* Proc. Roy. Soc. Queensland, Vol. XXXIV., No. 12, Dec. 1922.

The characteristics which Mr. Francis has found may conveniently be noted in the field as an assistance to identification are as follows. Channelled or fluted barrels; conspicuously fissured barks; yellow inner barks; ochre-coloured inner barks; wrinkled surface in the sapwood; patches, streaks or specks of black wood similar to ebony; very soft woods; woods depositing brightly coloured ashes; coloured woods; large medullary rays (*Proteaceae*); laticiferous; wood or sap changing colour on exposure; odour of freshly cut bark or sapwood; deciduous leaves; brilliant leaf coloration in age.

In discussing buttresses generally the interesting observation is made that plank buttresses are common in all the luxuriant rain forests even in those at an altitude of 3,500 feet in latitude 28·2 degrees South, on the MacPherson Range, so that it can be definitely stated in Queensland, at any rate, that the phenomenon of well developed buttresses is not confined to the tropical forests, but occurs in relatively temperate climates when the annual rainfall approximates or exceeds 60 inches.

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**Original Drawings of the Botanical Magazine.**—From the time when Sir William Hooker came to Kew in 1841 the original drawings for the Botanical Magazine plates have been preserved in the collection of drawings in the Herbarium; these were principally the work of Mr. W. H. Fitch and Miss M. Smith. In May, 1891, Kew was fortunate to secure 1625 plates of an earlier date from Mr. F. Curtis of Staines, a descendant of William Curtis, the founder of the Magazine. Further progress towards the completion of the set has now been made by the receipt of 165 drawings, mainly belonging to the period between August 1830, and August 1834, although one (t. 309) dates back to August 1795. These were purchased in 1922 from a member of the Curtis family by Mr. A. Bilney and presented by him to the Royal Horticultural Society, the Council of which, with Mr. Bilney's sanction, generously transferred them to Kew. Many of the drawings are by Sir W. J. Hooker and J. Curtis, while amongst the other artists are :—W. Herbert, t. 2385 (reproduction says, J. Curtis); Charles M. Curtis, t. 2619; James McNab, tt. 3025 and 3252; Dr. T. Nicholson, t. 3071; J. D. Sowerby, tt. 3078–3080; Mrs. Arnold Harrison, t. 3116; Dr. R. K. Greville, t. 3142; Sydenham Edwards, t. 3153; "E. D." t. 3155 (adapted by Sir W. J. Hooker); Dr. J. Scott, t. 3187; Rev. R. T. Lowe, tt. 3227 and 3234, and Dr. C. W. Short of Lexington, t. 3232. Many of the plates bear instructions from Sir W. J. Hooker (when editor) to Mr. George Graves as to colouring the lithographs, two letters on which are preserved in Sir W. Hooker's correspondence. The series furnishes interesting examples of the styles of the various artists.—C.H.W.

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

No. 5] [1923.

## XVI.—STREPTOLOPHUS, A NEW GENUS OF GRAMINEAE.

D. K. Hughes.

In October 1921 some seeds were received at Kew from Mr. J. Gossweiler, Director of the Botanic Gardens, Angola. These were sown and by the summer of the next year a profusely branching grass, 3–6 ft. high, was reared. The extremely slender branches, rambling in all directions, gave it a delicate and pleasing appearance. It was remarkable from the first in that the leaf blades were conspicuously sagittate and inserted on slender petioles which stood out at an angle and held them well away from the leaf sheaths. These petioles were hardly noticeable on the young shoots but developed after the leaves were unrolled, becoming 1–2 ins. long or even longer on the older portions. At this stage an attempt was made to name it, but without success, though in foliage it was somewhat similar to *Setaria sagittifolia* Walp. When the flowers appeared they were found to be as remarkable as the leaves. The panicoid structure with the reduction of the branchlets into bristles suggested *Setaria*, but unlike that genus the bristles were slightly flattened and became more or less fused at the base into clusters or fascicles. By means of a cushion of parenchymatous cells which developed at the base, each cluster became reflexed and finally disarticulated from the main axis. This fusion of bristles and final disarticulation of the clusters is strongly suggestive of *Cenchrus* or the Australian genus *Plagiosetum*, but unlike *Cenchrus* the clusters or burrs are stalked, the bristles are branched above the base and the fusion is irregular. In *Plagiosetum* the bristles are finer and do not become reflexed as in *Streptolophus*, nor do the clusters, which are much simpler in structure, develop into burrs. Thus *Streptolophus* seems intermediate betweeen *Cenchrus* and *Plagiosetum* and, standing as a separate genus, provides a link between the two, at the same time keeping our former conception of each intact.

*x* (78)19007 Wt 396—P 32 1000 5/23 A

It might perhaps be observed that to a grass with weak decumbent stems the attachment of the leaf blades by a very narrow base to their slender petioles is probably of great advantage with regard to leaf movement. There are, moreover, at the bases of the leaf blades and of the petioles cushions of parenchyma which are possibly capable of heliotropic or, like those of the culm nodes, geotropic movement. It would be interesting to see the results of experiments made in this direction.

**Streptolophus** *Hughes* [Gramineae-Cenchrastrae] gen. nov.; affinis *Cenchro* Linn., sed glomerulis distincte pedunculatis, involucro imperfecto setis ramosis constituto differt.

*Spiculae* sessiles vel subsessiles in glomerulos laxe paniculatos tandem reflexos demum deciduos setis ramosis imperfecte involucratos dispositae. *Glumae* subaequales, paucinerves, membranaceo-hyalinae, spicula multo breviores. *Anthoecium* inferum ad valvam herbaceo-membranaceam spiculam aequantem reductum. *Anthoecium* superum ♂ : valva membranacea paulo indurata; valvula valvam aequans. *Lodiculae* 2, minutissimae. *Stamina* 3. *Ovarium* glabrum; styli longi, terminales; stigmata plumosa, brevia, ex apice spiculae exserta. *Gramen* annuum, vagans; *foliorum* laminae sagittatae, petiolatae, vernatione convolutae; *ligulae* elongatae, membranaceae. *Panicula* angusta, composita, ramis primariis glomeruliformibus, infimis uti axis primarius in spicam brevem apice seta terminatam elongatis; glomeruli compositi, secundarii spiculas 2–1 setis (ramulis commutatis) basin versus confluentibus quasi involucro suffultas et supra eas setarum sterilium comam gerentes.

Species unica, Angolensis.

**S. sagittifolius** *Hughes*. *Gramen* profuse vagans ad 2 m. altum. *Culmi* decumbentes vel geniculato-ascendentes, iterum ramosi, multinodes, nodis exsertis sparse pubescentibus. *Folia* ubique leviter retrorsum scabrida; vaginae solutae ad margines osque longe ciliatae, nervis prominentibus striatae; ligulae usque ad 2 mm. longae; petioli usque ad 5 cm. longi, apice dense pubescentes; laminae e basi sagittata lanceolatae, apice longe attenuatae, 9–10 cm. longae, 1·5–2 cm. latae, subtus sparse pubescentes. *Inflorescentia* exserta, circiter 12 cm. longa, 2–3 cm. lata, ramis (glomerulorum pedunculis) usque ad 3 cm. longis. *Glomeruli* 0·5–1·5 cm. longi anthesi virides, mature fusci vel purpureo-fusci; setae involucri demum induratae reflexae, comae erectae vel oblique patentes. *Spiculae* ovato-lanceolatae, 3·5 mm. longae. *Glumae* rotundatae, hyalinae, apice papillosae; inferior enervis, 0·6 mm. longa; superior sub 3-nervis, 1 mm. longa. *Valva* inferior 5-nervis, viridis, scaberula. *Valva* superior ovato-lanceolata, subpruinosa. *Antherae* 2 mm. longae. *Stigmata* exserta, 1·5 mm. longa. *Caryopsis* late oblonga, 2 mm. longa, a dorso leviter compressa.

*Streptolophus sagittifolius.* I, flowering shoot, × ½; II, spikelet showing lower glume and lower valve, × 10; III, spikelet showing upper glume and upper valve, × 10; IV, portion of a glomerule showing spikelet supported by branched bristles, × 4; V, lower glume, × 10; VI, upper glume, × 10; VII, upper floret, × 10.

West Tropical Africa. Angola, *Gossweiler*.

The spikelets which are sessile on the short spike terminating the primary axis persist after the glomerules have fallen off. I have examined a number of these but have not found any grain although there is always an ovary present. I assume from this, therefore, that they are usually, if not always, sterile.

## XVII.—DIAGNOSES AFRICANAE: LXXVII.

1681. **Clematis altissima** *Hutchinson* [Ranunculaceae]; affinis *C. Simensi* Fres., sed foliolis late ovatis acute acuminatis, bracteis ultimis inferioribus parvis nec foliatis, pedicellis longioribus gracilibus differt.

*Planta* scandens usque ad 36 m. alta (*Mann*); rami graciles, nodis minute puberulis exceptis glabri, sulcati. *Folia* plerumque 5-foliolata, superiora simplicia, glabra; foliola late ovata, basi rotundata vel subcordata, apice acute acuminata, 5–8 cm. longa, 3–5 cm. lata, tenuiter chartacea, crenato-dentata, basin versus integra, glabra, plerumque 5-nervia, nervis supra leviter impressis infra prominentibus, venis paucis laxe ramosis. *Inflorescentia* laxe paniculata, foliis multo longior; bracteae parvae, nec foliaceae, oblanceolatae, acutae, usque ad 1·3 cm. longae, superne breviter ciliatae; pedicelli graciles, ad 1·5 cm. longi, breviter pubescentes vel demum glabrescentes. *Sepala* oblongo-elliptica, subacuta, 7–8 mm. longa, 3 mm. lata, 3-nervia, utrinque parce pubescentia, marginibus breviter lanato-tomentosis. *Stamina* usque ad 6 mm. longa; filamenta basin versus longe villosa; antherae fere 2 mm. longae. *Carpella* dense sericeo-villosa, demum laxe pilosa et stylo persistente circiter 1·5 cm. longo plumoso coronata.

Tropical Africa. Fernando Po, from 1350–2700 m., fl. Nov. 1860, *Mann* 576 (type). Cameroons: Cameroon Mtn., 1660–2300 m., fl. Dec. 1862, *Mann* 2170; fl. & fr., Jan. 1862, *Mann* 1245. *H. H. Johnston* 28; 103.

1682. **Tetracera affinis** *Hutchinson* [Dilleniaceae]; affinis *T. potatoriae* Afz. et *T. erianthae* Hutch., ab illa inflorescentia elongata multiflora, floribus extra tomentellis, ab hac petiolis non alatis, bracteis deciduis differt.

*Arbor* parva; ramuli ultimi flexuosi, pilis basi tuberculatis setoso-pubescentes, internodiis circiter 3 cm. longis. *Folia* late elliptica vel leviter obovato-elliptica, apice rotundata, basi brevissime cuneata, 6–7 cm. longa, 3–4·5 cm. lata, rigide chartacea, superne repando-denticulata, dentibus circiter 5 mm. distantibus, supra scabrida, infra in nervis lateralibus appresse pubescentia; costa supra impressa, infra valde prominens; nervi laterales utrinsecus circiter 10, a costa sub angulo 50° abeuntes, infra prominentes; petioli 1–1·5 cm. longi, basin versus incrassati, supra canaliculati, appresse setuloso-pubescentes. *Inflorescentia*

multiflora, laxe paniculata, basin versus parce foliata, tomentella, usque ad 25 cm. longa et 12 cm. diametro; rami erecto-patentes, dichotome ramosi; bracteae deciduae; pedicelli subnulli vel usque ad 2 mm. longi. *Sepala* plus minusve rotundata, coriacea, usque ad 6 mm. longa, utrinque setuloso-tomentella. *Petala* obovata, circiter 8 mm. longa, extra appresse pubescentia, marginibus incurvis glabrescentibus, intra villosa. *Filamenta* glabra, basi connata. *Carpella* 3, breviter villosa; styli crassi, 5–6 mm. longi, glabri.

Tropical Africa. Gold Coast: Akwapim Hills, flowers yellowish white, 20 Oct. 1900, *W. H. Johnson* 796.

1683. **Tetracera eriantha** *Hutchinson* [Dilleniaceae]; affinis *T. potatoriae* Afz., sed foliis basi cuneatis, petiolis alatis, bracteis magnis subpersistentibus, sepalis et petalis extra appresse villosis differt.

*Arbor* usque 10 m. alta; ramuli ultimi flexuosi vel tortuosi, teretes, internodiis circiter 2 cm. longis, appresse pubescentes. *Folia* obovata vel elliptico-obovata, apice rotundata, basi in petiolum alatum cuneata, 5–12 cm. longa, 2·5–5·5 cm. lata, fere integra, rigide chartacea vel subcoriacea, supra fere glabra et subnitida, infra laxe pilosa; costa supra profunde impressa, infra valde prominens; nervi laterales utrinsecus 12–18, a costa sub angulo 45° abeuntes, infra prominentes, marginem versus furcati; petioli 0·5–2 cm. longi, supra late canaliculati, alati, minute strigosi. *Inflorescentia* paniculata, laxiflora, usque ad 15 cm. longa; bracteae subpersistentes, magnae, oblongae, usque ad 1·8 cm. longae et 0·8 cm. latae, infra appresse villosae, supra minute pubescentes; pedicelli circiter 5 mm. longi, tomentosi. *Sepala* obovato-rotundata, coriacea, 5 mm. longa, villosa. *Petala* exteriora appresse villosa, intima fere glabra, circiter 0·8 cm. longa. *Filamenta* glabra, filiformia. *Carpella* 3, villosa; styli subgraciles, 5 mm. longi, glabri.

Tropical Africa. Fernando Po, calyx green, corolla white, fl. Dec. 1859, *Mann* 79 (type). Southern Nigeria; Oban, *Talbot* 1320.

The difficulty collectors experience in obtaining flowering and fruiting specimens of the trees of the Tropical African Evergreen Forest is well seen in the fragmentary material by which most of the *Anonaceae* are known even at the present time. Where the flowers are unisexual and especially when the trees are dioecious, it is not advisable to consider material collected at different times and in different places as representing the corresponding sexes of the same species particularly when there are differences in the vegetative organs and indumentum.

In the following case material with male flowers collected by Mann in 1861 on the Gabon River (No. 960) and the material with female flowers collected by him on Mount John, Kongui River, Cameroons (No. 1782) was treated by Oliver in the Flora of Tropical Africa Vol. I. p. 23 as being opposite sexes of the

same species. There seems no justification for this especially as there are several points in which these two collections differ. Until material is discovered that shows without doubt that they are the same these collections should be kept separate.

1684. **Popowia cauliflora** *Chipp* [Anonaceae]; affinis *P. diclinae* Sprague, sed petiolis tenuibus cymis numerosissimis confertis pubescentibus ex ramulis adultis ortis differt; a ceteris speciebus africanis tropicis occidentalibus foliis petiolatis adultis subtus pilosis vel pubescentibus nervis lateralibus utrinsecus 12–18 differt.

*Ramuli* novelli dense ferruginosi pubescentes. *Folia* breviter petiolata membranacea, supra glabra praeter costam nervosque, subtus pubescentia, oblanceolata vel oblonga, basi attenuata rotundata, apice obtusata acuminata, 15 cm. longa, 5–6 cm. lata, nervis lateralibus utrinsecus circiter 14. *Cymae* numerosissimae ex ramulis adultis ortae; flores numerosi, dense pubescentes, 5 mm. diam.; pedicelli dense pilosi, 2·5 cm. longi. *Sepala* minuta, extra pubescentia, intus glabrata, lanceolata, acuta, 1 mm. longa. *Petala* exteriora pubescentia, 4 mm. longa; interiora cuneata, minutissime pubescentia, 1 mm. longa. *Carpella* numerosa; ovaria pilosa; stigmata sessilia, glabra. *Monocarpella* stipitata, pubescentia, inter semina valde constricta. ♂ flores ignoti. *Clathrospermum Mannii* Oliv. ex parte (quoad spec. ♀ ) Fl. Trop. Afr. 1. p. 25; *Popowia Mannii* Engl. et Diels ex parte, Monogr. Anonac. p. 49, non Baill.; *Popowia diclina* Sprague, ex parte, Kew Bull. 1908, p. 53.

Tropical Africa. Nigeria: Old Calabar, *Thomson*. Cameroons: Kongui River, Mt. John, *Mann* 1782.

1685. **Popowia diclina** *Sprague* emend. *Chipp* [Anonaceae]; affinis *P. cauliflorae* Chipp, sed petiolis crassis cymosis paucis dense pilosis ex ramulis novellis ortis differt; a ceteris speciebus africanis tropicis occidentalis foliis petiolatis adultis subtus pilosis vel pubescentibus nervis lateralibus utrinsecus 12–18 differt.

*Ramuli* novelli dense tomentelli. *Folia* breviter petiolata, membranacea, supra glabra praeter costam nervosque, subtus dense pilosa, oblanceolata, basi attenuata, rotundata, apice obtusa acuminata, 22 cm. longa, 8 cm. lata, nervis lateralibus utrinsecus circiter 14. *Cymae* paucae, dense pilosae, ex ramulis novellis ortae; flores pilosi, 3 mm. diam.; pedicelli 7 mm. longi. *Sepala* minuta extra dense pilosa, intus glabrata, oblonga, apice acuta, 1 mm. longa, 0·7 mm. lata. *Petala* exteriora extra dense pilosa, intus pubescentia, basi concava, supra crassa, acuta, 2 mm. longa, 3 mm. lata; interiora cuneata, pubescentia, 1 mm. longa. *Staminodia* minuta, numerosa. *Stamina* 1 mm. longa; thecae oblongae; connectiva pubescentia. ♀ flores ignoti. *Clathrospermum Mannii* Oliv., ex parte (quoad spec. ♂ ) Fl. Trop. Afr. i. p. 25; *Popowia Mannii* Engl. et Diels ex parte, Monogr. Anonac. p. 45, non Baill.; *Popowia diclina* Sprague, ex parte, Kew Bull. 1908, p. 53.

Tropical Africa. Gabon: Gabon River, *Mann* 960; Libreville, *Pierre* 2922.

1686. **Xylopia villosa** *Chipp* [Anonaceae]; *X. Ellioti* Engl. et Diels, affinis, sed ramulis novellis densissime ferruginoso-pilosis floribus plerumque dense fasciculatis petalis interioribus linea transversa pilorum longorum alborum intus ad basim instructis differt.

*Arbor* excelsa, ramulis novellis densissime ferruginoso-pilosis, adultis glabris. *Folia* petiolis dense ferruginoso-pilosis, subcoriacea, supra glabrescentia, subtus adpresso-pilosa, oblonga vel lanceolata, basi rotundata, apice acuta vel acuminata, 8–12 cm. longa, 3–5 cm. lata, nervis lateralibus utrinsecus 6–8. *Flores* dense fasciculati haud solitarii; pedicelli densissime ferruginoso-villosi; bracteolae tomentosae, late ovatae. *Calyx* extra tomentosus, intus glaber; lobi late triangulati, 2 mm. longi, 3 mm. lati. *Petala* exteriora basi dilatata, supra linearia, extra dense sericea, intra ad basim glabra, 3 mm. longa, medio 3 mm. lata; interiora paullo minora, albo-sericea, intus ad basim glabra sed linea transversa pilorum longorum alborum instructa. *Stamina* linearia, 2 mm. longa, connectivo dilatato producta. *Carpella* pilosa. *Fructus* ignoti.

Tropical Africa. Nigeria: Ibadan Forest Reserve, flowering November, *Punch* 119; flowering October, *Foster* 354.

1687. **Smithia parvifolia** *Burtt Davy* [Papilionaceae-Hedysareae]; species *S. recurvifoliae* Taub., affinis, sed stipulis minoribus latioribus obscurioribus, foliolis eciliatis et nervis non prominentibus differt.

*Frutex* 1–1·5 m. altus. *Ramuli* annotini teretes, nigrescentes, hispiduli, 2 mm. crassi, hornotini breves, tenues, circiter 1 mm. crassi, glanduloso-hispiduli, stipulis persistentibus squarrosis ornati. *Folia* 5-juga, circiter 1 cm. longa, recurva; rhachis hispidus; foliola dense imbricata, oblique ovalia, obtusa, mucronata, 3–4 mm. longa, costa infra parce setosa excepta glabra; costa valde excentrica, lata, pulla; nervi laterales inconspicui; stipulae persistentes, ovatae, acutae, circiter 2 mm. longae, ciliatae, atrobrunneae, marginibus pallidioribus. *Inflorescentia* ad ramulos laterales breves terminalis. *Flores* 1–3, circiter 1·5 cm. longae. *Calyx* profunde 2-partitus; lobi circiter 9 mm. longi, pubescentes vel hispidi. *Corolla* glabra, striata, caerulea. *Legumen* non visum.

South Africa. Transvaal: Barberton Dist.; river banks at Bosch's, near Barberton, 1300 m., fl. Sep., 1889, *Galpin* 532!

1688. **Kalanchoë connata** *Sprague* [Crassulaceae]; affinis *K. brachylobae* Welw., foliis basi connatis conspicue bicrenatis necnon collo (parte superiore) corollae tubi longiore distincta.

*Planta* erecta, circiter 1 m. alta., undique glabra. *Caulis* teres, laevis, basi 2 cm. diametro, apice (sub inflorescentia) 4 mm. diametro; internodia basalia 0·7–1·5 cm. longa, superiora 11–12 cm. longa. *Folia* ovato-oblonga, rarius ovata, dimidio

superiore arcuatim recurva, apice obtusissima, in basin late cuneatim angustata, 9–11 cm. longa, 4·5–5 cm. lata (folia ovata 7 cm. longa, 4·5 cm. lata), supra partem basalem cuneatam integram conspicue bicrenata, crenis primariis crenula singula inferne instructa; nervus medius supra propter plicationem laminae valde impressus; folia superiora oblongo-lanceolata vel anguste lanceolata, 7–9 cm. longa, 2–3·5 cm. lata, potius dentata quam crenata. *Thyrsus* bracteatus, in toto 3 dm. longus; bracteae inferiores lineares, obtusae, 5 cm. longae, 7 mm. latae, integrae, superiores subulatae, gradatim minores, ultimae circiter 3 mm. longae; pedunculi dichasiorum 4–14 cm. longi; dichasia bis furcata, deinde in monochasia transientia, 20–25-flora; pedicelli 7 mm. longi. *Sepala* lineari-lanceolata, acute acuminata, recurvo-ascendentia, 1 cm. longa, 1·6 mm. lata. *Corollae tubus* viridi-luteus, ampullaeformis, vix 1·5 cm. longus, infra medium rite quadrangularis; lobi supra flavo-lateritii, recurvi, obovato-lanceolati, in toto 9 mm. longi, 4–4·5 mm. lati, apice uncati, unco ultra 1 mm. longo. *Stamina* omnia antherifera, inferiora 8 mm. supra basin, superiora 10 mm. supra basin inserta; filamenta inferiora 2 mm. longa, superiora vix ultra 1 mm. longa. *Squamulae* flavae, linearisubulatae, 4·5 mm. longae. *Pistilla* 1 cm. longa; styli circiter 2·5 mm. longi; stigmata extrorsum spectantia.

Tropical Africa. Angola. Described from a living plant received from Mr. M. T. Dawe in 1921, which flowered at Kew in January 1923. The inflorescence greatly resembles that of *K. brachyloba* Welw., but the narrow upper part of the corolla-tube is considerably longer and the foliage is very different.

1689. **Homalium (Eublackwellia) subsuperum,** *Sprague* [Samydaceae-Homalieae]; affine *H. dentato* (Harv.) Warb., a quo pedicellis brevioribus, ovario maxima pro parte supero recedit.

*Ramuli* subangulati, vix 2 mm. diametro, fusco-brunnei, dense lenticellati; internodia 0·7–1·5 (–2) cm. longa. *Folia* elliptica, apice breviter acute cuspidata, basi obtusa vel breviter subcuneata, 4·5–6·5 cm. longa, 3–4 cm. lata, grosse crenato-serrata, tenuiter coriacea, glabra, utrinsecus 5–6-nervia, nervis sub angulo 45° vel minore excurrentibus supra satis obviis subtus prominentibus, rete venularum utrinque praecipue subtus manifesto; crenae 4–8 mm. longae; petioli 1·5–2 mm. longi; gemmae axillares pulvinares transverse oblongae, 1·5–1·7 mm. latae, nitidulae, spadiceae. *Thyrsi* axillares, infra gemmas orti, subpyramidales, 3–5 cm. longi, inferne circiter 2·5 cm. diametro; pedicelli 0·8 mm. longi, 0·3–0·4 mm. infra apicem articulati. *Flores* hexameri, dense minute pubescentes. *Sepala* anguste triangularia obtusa, vel subacuta, 1·25 mm. longa, basi 0·6–0·7 mm. lata. *Petala* oblonga, apice rotundata, 1·7 mm. longa, 0·8 mm. lata. *Staminodia* episepala, pulvinaria, dense pubescentia, 0·5–0·6 mm. lata. *Stamina* epipetala; filamenta 2·75 mm. longa, glabra. *Ovarium* trimerum, basi in torum paullulo (0·3–0·4 mm.) immersum, in toto 1·5 mm. longum, extra patule

pubescens, intus longius pilosum, in stylum 1 mm. longum sensim angustatum; styli rami 0·7–0·8 mm. longi.

South Africa. Cape Province: Transkei; Ndindini Forest, *J.E.Kaufmann in Herb. Forest Dept.* 3225 (*S. Afr. Nat. Herb.* 2571) (type). Natal: Oudeni Forest Reserve, *Farrell in Herb. Forest Dept.* 3299 (*S. Afr. Nat. Herb.* 2570).

The Natal specimen has longer pedicels (1·4 mm. long, articulate 0·8 mm. below the apex), slightly larger and more pubescent flowers, acute sepals and the ovary slightly more sunk (0·6 mm.) in the torus. It agrees so closely, however, in other respects that it seems inadvisable to separate it, even as a variety. According to Mr. Farrell, *Homalium subsuperum* is found all over the Oudeni Forest Reserve, and attains a height of about 60 ft. and a diameter of 2 ft. The native name is Ndhlebenhlovu.

1690. **Leucospermum cordatum** *Phillips* [Proteaceae-Proteeae]; affine *L. hypophyllo* R. Br. foliis cordatis differt.

*Frutex* prostratus. *Rami* elongati, paullo pilosi. *Folia* horizontalia vel leviter reflexa, 3·5–4·3 cm. longa, basi 1·8–2·2 cm. lata, ovata, apice obtusa, basi cordata, pilosa et minute tomentosa, demum glabra. *Capitula* pedunculata, apice ramorum solitaria vel rare 3-nata, 3 cm. lata, pedunculo 2 cm. longo tomentoso bracteas ovatas pilosas ciliatas gerente. *Receptaculum* 7 mm. longum, 5 mm. latum, conicum. *Bracteae* flores subtendentes 1 cm. longae, obovatae, aristatae, basi angustatae, dense villosae, ciliatae. *Calycis tubus* 5 mm. longus; lobi 9 mm. longi, lineares, pilosi, apice dilatato 3 mm. longo elliptico piloso. *Antherae* 2 mm. longae, lineares. *Ovarium* 2·5 mm. longum, glabrum; stylus 1·7 cm. longus, glaber; stigma 1·7 mm. longum, conicum.

South Africa. Caledon Div.: Hottentots Holland Mountains, 800 m., among loose stones and grass, October 1922, *T. P. Stokoe* (*National Herbarium, Pretoria*, No. 2607).

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## XVIII.—MISCELLANEOUS NOTES.

**Coffee and Para Rubber in Uganda.**—In the *Bulletin* for 1921 (p. 346) a note was published on a "Report on a visit to Guatemala and Costa Rica to investigate the methods of Cultivation of Coffee," by Mr. Le Poer Trench, Kenya Colony. Supplementary to this it may be of interest to refer to "A Report on Coffee Cultivation in Uganda with Comparative Notes on Costa Rica," by Mr. C. H. Lankester (of Las Concavas Estate, Costa Rica),[1] and in conjunction with these "A Report on Para Rubber in Uganda," by Mr. Herbert Ashplant,[2] may be conveniently considered, as the cultivation of these two plants appears to have been carried on together, more or less successfully, in Uganda.

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[1] Circular No. 7, Dept. of Agric., Kampala, Uganda.
[2] „ No. 6, „ „ „ „ , Nov. 1921.

It is reported that three main types of Coffee are grown in the Protectorate. These are, in relative order, two varieties of *Coffea arabica*, known respectively as "Nyasa" and "Bourbon," and *Coffea robusta*, which is apparently indigenous to Uganda in the regions bordering on the Congo. The "Nyasa" variety is indistinguishable from that grown in Costa Rica. Of the *arabica* varieties, "Nyasa" seems to prosper best in the lower and warmer regions and "Bourbon" in the higher and cooler areas. *Robusta*, again, thrives in almost any situation where coffee is grown, but it is especially suited to lower elevations, and would prove an economic crop when the others would fail (Lankester, p. 5). The selection is left to individual preference, but of the two varieties of *arabica* "where shade is not advisable" "Bourbon" is considered to offer the greater number of advantages, including that of being a precocious cropper. The two forms are said to have hybridised very extensively; the constant distinguishing features of the two original forms are said to lie in the colour of the young terminal leaves. In "Bourbon" they are a very pure bright green, in "Nyasa" more or less bronze or copper-coloured, the latter being the dominant type (*id.* p. 6). In connection with the desirability of cultivating one special variety Lankester states that "the London Brokers indicate a preference for Coffee of 'Bourbon' type owing to good liquoring qualities."

In the opinion of the Coffee Expert to Messrs. Lewis & Peat (London) "Bourbon Coffee, as grown in Nyasaland, is a desirable commercial form and worth growing where others will not succeed." "The great majority of estates are interplanted with Para Rubber (*Hevea brasiliensis*) and coffee has proved of great service in bridging over the long wait till the rubber comes into production. Several estates, however, show that coffee may be a permanent crop, and yields of 5 cwt. clean coffee to the acre have been averaged. The soil is fertile, as evidenced by the fine 'Mvuli'[1] trees, but light and sandy in texture, and very subject to wash on the least slope. Sugar cane and Tobacco, it is suggested, may prove profitable alternatives. Labour shortage has been advanced as a reason for the abandonment of estates or restriction of areas. Coffee under 'Mvuli' shade, even on abandoned estates, always looks well and carries an apparently productive amount of cherry" (*id.* p. 4).

The area under coffee in 1920 was 25,437 acres, and it is explained that "the area of some 7,000 acres formerly in cultivation under Para can be discounted now as having been shaded out, and probably some 8,000 to 10,000 acres have been abandoned, owing to currency adjustments, restrictions of credit, and, in some cases, labour difficulties, leaving approximately 15,000 acres at present in cultivation. The amount of native production is negligible" (*id.* p. 3). The total acreage of Para Rubber under European management in Uganda (1921) was approximately 17,000 acres, about 9,500 being under 5 years old and 7,500 over

[1] *Chlorophora excelsa.*

5 years old, and there were about 900 acres of native grown Para, mostly in the Buganda Province. Some 12,000 acres out of the 17,000 acres of European-owned Para were interplanted with *Coffea arabica*. Unlike the rubber in the Middle East, there is no considerable acreage concentrated in any one spot. "Even in the case of the plantations controlled by the few limited companies, the largest compact block barely exceeds 500 acres. By far the greater portion of the rubber is distributed as 50 to 250 acre estates, situated for the most part in the Kiagwe district." (Ashplant, p. 3). The low temperatures of high altitudes have been found to have a very retarding effect upon the growth of *Hevea*. The yields also become progressively poorer as greater elevations are reached. Uganda is said to compare unfavourably in these respects with other rubber countries in the East, which excepting a few thousand acres in Java, Ceylon and South India are within a few hundred feet of sea-level. The Buganda Province in which most of the rubber is grown has an annual rainfall of only about 50 inches; but the regular distribution of the rainfall throughout the year and the high moisture retaining capacity of the soils are calculated to do much to make up the deficiency (Ashplant, p. 4).

In spacing, when the needs of the two crops have to be allowed for, the avenue system, say 15 ft. by 30 ft., offers special advantages, but the susceptibility of the local trees to wind damage would make such wide gaps inadvisable on Uganda estates, where the damage done by wind is serious, and, "all things considered, perhaps the best spacing is a modification of the 24 ft. by 24 ft. system, whereby an extra tree is planted in the middle of each square. This system, which has been carried out on one or two of the younger estates, permits of the planting of three rows of coffee between the lines of rubber and gives approximately 130 Hevea trees to the acre" (*id.* p. 19). Nearly all the Para rubber in Uganda has been interplanted with Arabian Coffee, and so far as one can judge from the appearance of the trees everywhere they have not suffered in any way from the competition of the Coffee bushes. The rubber tree shade is beneficial up to about the sixth year, when it becomes increasingly prejudicial, and after the seventh or eighth year it is doubtful whether the small crop of coffee borne is worth the picking. "The fact that coffee can be productive for so long a period under *Hevea* is undoubtedly some compensation for the long wait before the rubber becomes revenue-producing in Uganda. Coffee interplanted with rubber in Malaya has to be taken out in the fourth year. The ability to grow two important crops like coffee and rubber intermingled has, however, not been an unmixed blessing; divided attention has frequently led to one or the other being neglected" (*id.* p. 17).

Cultivation, Harvesting, Preparing, Machinery and Diseases are also discussed by the respective authors. Lankester concludes with the statement that it is inadvisable to brand coffee as "Costa

Rica" even if grown from seed derived from that country, as well prepared Uganda Coffee is sufficient to stand on its own merits. In view of the rubber crisis, Ashplant's concluding remarks are of interest. He discusses the prospects of existing estates, advising the retention of those well established of 50 acres and upwards; but in the case of smaller estates, which would not justify the erection of proper equipment, as an alternative to increasing the acreage to a profitable standard he advises that "if the rubber is still young and occupying good coffee land, there should, if an extension of the latter crop is feasible, be no question about displacing the rubber in favour of coffee."

J. H. H.

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**A New Book on Pears.***—This work is the sixth of its series, former volumes by the same author having dealt with grapes, apples, plums, peaches and cherries. They are published by the New York Agricultural Experiment Station and if, as is hoped, they are followed by similar treatises on small fruits, the whole should eventually form an encyclopedia of the greatest value on fruit cultivation in temperate regions. In noticing previous volumes we have testified to the remarkable care and comprehensiveness Dr. Hedrick and his assistants have shown in their preparation. To say that this volume falls in no way short of its predecessors is to give it high praise. Its aim is to provide a complete record of the development of the pear from the earliest to the present time; to describe more or less fully the cultivated varieties; and to give their synonymy, bibliography and economic value. The work is intended primarily for cultivators and students in the United States and particularly in New York. Nearly eighty of the varieties most important in those areas have been selected for especial and more detailed description, and each of these varieties is illustrated by an excellent coloured plate. The numerous minor varieties are more briefly and summarily described.

The pear as generally known in gardens is derived exclusively from *Pyrus communis* Linn., a tree whose native habitat is South Europe and Western Asia. In France and Central Europe *Pyrus nivalis* Jacquin, is sometimes cultivated, the fruits being used for perry-making and, when bletted, for dessert. It is known as "snow pear." A third species, *P. serotina* Rehder, native of China and commonly called "Sand pear," is of some importance in North America, where, in the South and Middle West States, hybrids between it and the common pear are found to be better adapted to the climate than the pure derivatives from *P. communis*, but their fruits are decidedly inferior to the best types of common pear. These three species may be said

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* The Pears of New York. By U. P. Hedrick. 1 vol. 4to (xii + 636 pp.), with eighty coloured plates and one portrait.

to comprise all the forms of *Pyrus* whose fruits are of any real value to mankind.

Dr. Hedrick gives a very interesting history of the pear from the times of the Ancient Greeks to the present day. He considers that the tree was commonly cultivated in Greece one thousand years before Christ. In referring to Theophrastus, who lived 600 to 700 years later, the author makes a rather sardonic reflection on modern horticultural scribes: "Out of one of the books of Theophrastus, *Enquiry upon Plants*, a very good treatise on the pear might be compiled and one better worth following than many of his more modern imitators." In tracing the history of this fruit in Italy, France, Belgium, England and other parts of Europe, Dr. Hedrick gives the palm to the Belgians who, by their cultural skill and careful breeding and selection, aided by a suitable climate and soil, have helped more than any other nation to bring it to its present perfection. "The pear was improved more in Belgium in one century than in all the centuries that had passed."

The climate in many parts of the United States is not congenial to the pear and trees seem to be much more subject to disease and insect pests than they are in Europe. We are informed that the Pacific States now form the main centre of pear cultivation in North America.

Although, as already intimated, this book is intended primarily for cultivators in the United States, it is of scarcely less value to fruit-growers in Europe. It should find a place in the libraries of all who are interested either commercially or scientifically in the pear.—W. J. B.

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**The Lloyd Herbarium.**—Recently an interesting collection of British Plants made by George Lloyd, M.D., has been presented to the Royal Botanic Gardens by Mrs. Lloyd through the Bournemouth Natural History Society.

Dr. Lloyd was born at Albrighton, Shropshire, in 1804 and graduated at Edinburgh in 1826. He did not practise medicine, but devoted his time to Botany. He knew Sir William Hooker well when the latter was at Glasgow, and in company with Sir Joseph Hooker and the botanist Arnott made careful collections of plants in England, Scotland, Ireland and Wales.

Most of the plants were collected between 1825 and 1843, but a few of later date were received from the Botanical Society of London and are incorporated in the collection.

The Herbarium which numbers some 1250 sheets is for the most part in an excellent state of preservation, and is mounted on sheets with a border of cardboard. It does not contain many "critical" species, but the following may be worthy of note, being either varieties or species which are now extinct in the British Isles :—

*Arthrolobium ebracteatum* DC. Coll. et Com. J. C. Lukis, Guernsey.

*Ononis reclinata* L. Galloway: "presented by Dr. Hooker, January, 1836."
*Sibbaldia procumbens* L. Ben Nevis: May 1825.
*Eryngium campestre* L. Durham: coll. Dr. Hooker; "presented 1832."
*Gentiana nivalis* L. Clova: "Dr. Hooker; presented 1832" (a very large specimen).
*Myosotis alpestris* Schm. Ben Lawers.
*Phyteuma spicatum* L. Mayfield; Sussex: "Mr. Borrer."
*Salvia Marquandii* Druce, under the name "*Salvia pratensis* var. *praecox* or *clandestina*": Vazon Bay, Guernsey. "W. C. Trevelyan August 1835." One of the earliest specimens of this species in existence. From the only locality known in the world where it is found over an area of a few square yards.
*Eriophorum alpinum* L. "Scottish Highlands, W. C. Trevelyan." This species has been for many years extinct in the only known British locality—the Moss of Restenet, Forfarshire.—C. V. B. M.

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**Xanthium spinosum in Neolithic deposits in Bulgaria.**—*Xanthium spinosum* is one of the commonest ruderal plants of Central Europe and the Mediterranean region. It has generally been considered by recent writers to be a native of South America. The strong arguments in favour of this view will be found summarized by Thellung in his Flore adventice de Montpellier, pp. 505–506, and many references to earlier literature on the subject will be found there.

Millspaugh and Sherff in their Revision of the North American Species of *Xanthium*, Field Museum of Natural History, Botanical Series, Vol. iv., No. 2, p. 14, April 1919, give the distribution as follows:—"Now generally distributed almost throughout the United States; found also in South America, where probably native, Central Europe, 'western Asia, southern Africa and in Australia'." It should also be pointed out that the centre of distribution of the genus is certainly to be found in the New World.

Another opinion, which was current among earlier botanists, that *Xanthium spinosum* was native in South Russia, was rejected by Ascherson (Verhandl. bot. Ver. Brandenb. xvii., 1875, Sitzb., p. 12, and l.c. xxii., 1880, Sitzb., p. 89). It may also be noted that according to L. Simonkai and Karl Flatt (Bot. Centrlb. Bd. lv., 1893, p. 365) both A. Florentin and also C. Spegazzini have collected fossil fruits ("false-fruits") of *X. spinosum* from the Pliocene beds in the Tertiary formation of the Pampas.

During a visit to Bulgaria last summer Dr. N. Stoianoff of Sofia University gave me some semi-fossilized fruits which careful comparison at Kew has shown to be those of *Xanthium spinosum*. These were obtained during excavations in prehistoric deposits near the village of Bogorow, 15 km. east of Sofia.

The "fruits" had been collected in considerable quantity and stored as if for use as food or fodder. The deposits are of Neolithic age and an account of them has been published in the Annuaire du Musée National de Sofia, 1921, pp. 217–222, Sofia 1922.

Whatever may be the real history of *Xanthium spinosum* in the Old World this discovery would seem to indicate that the species existed in South Europe long before the dates (1700–1750) accepted by Thellung for its first introduction and establishment.—W. B. T.

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**Plant Names.***—The admirable little book compiled by Dr. Lindsay for the gardener and lover of flowers who know "small Latin and less Greek" provides in a compact form explanations of the scientific names of flowers whose meanings must ordinarily be sought in bulky lexicons, and much information on the principles and history of plant naming with which the general public are little acquainted. It is for the horticulturist and amateur gardener what Dr. Daydon Jackson's "Glossary of Botanic Terms" is for the botanist, and, since Alcock's "Botanical Names for English Readers" (1876) is now out of print, it is a welcome addition to the gardener's library. The delightful manner in which the information is imparted will make it the more appreciated by the section of the public for whom the work is intended. The author must be congratulated on producing a book which every amateur gardener, horticulturist, and teacher of nature study will find of much interest and utility.

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**Quebracho Colorado.**—*Quebrachia Lorentzii* Griseb. (*Anacardiaceae*), is an important forest tree abundant in the northern parts of the Argentine Republic and found also in Paraguay. It is described as of peculiar appearance, with small leaves and a trunk with a rough bark often covered with moss-like lichens of which cattle are stated to be very fond. The timber is extremely hard, close-grained and durable, light in colour when first cut becoming dark red on exposure to the light and air. The name Quebracho signifies axe-breaking as the wood is difficult to work and will soon turn the edge of the finest tempered tools. Formerly the chief application of the wood was for railway sleepers in South America, but during recent years it has become of first importance as a tanning material for

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* Plant Names. By T. S. Lindsay, B.D., London. The Sheldon Press, S.P.C.K. House, Northumberland Avenue, W.C. 1923. pp. 93. **2*s.* 6*d.***

which purpose the tree was felled, denuded of its sapwood and the logs finally shipped to the United States of America and to Germany. At the present day the extract is prepared on the spot by a simple process, the logs being put through a machine which reduces them to chips which are then boiled in water until all soluble matter is extracted from them. The solution thus obtained is concentrated down to the consistency of pitch, and in this form, after being dried, it is exported to all parts of the world for the use of tanners.

From a recent report issued by the United States Department of Commerce it appears that there is a danger of the extinction of the Quebracho forests owing to the wasteful methods of exploitation. The Report states that "the total available tonnage of Quebracho standing in 1922 has been liberally estimated at 71,300,000 metric tons for Argentina and 3,500,000 metric tons for Paraguay. A minimum estimate of the potential production of Quebracho extract by the companies now operating in Argentina and Paraguay is about 240,000 metric tons per annum, and as 1 ton of Quebracho extract represents about $4\frac{3}{4}$ tons of logs it would require an annual felling of 1,400,000 metric tons of Quebracho wood for tanning purposes alone in these two countries. Add to this the annual felling for construction work, paving blocks, fuel, telegraph and telephone poles, for which this wood is extensively used, also an annual requirement of 3,600,000 railway sleepers, 1,600,000 fence posts, and an annual exportation of Quebracho logs varying from 108,945 metric tons in 1917 to 56,582 in 1920 (decrease due to world-wide industrial and commercial depression) and the duration of the present stands of Quebracho wood can be readily grasped, together with the necessity for forest protection and the restoration of denuded tracts. This should not prove difficult, as with proper forestry methods the natural stock can be replaced in 25 to 50 years.

"With the extension of railroads through the forestal regions, the greater exploitation of Quebracho will be facilitated, and as an increasing demand for leather may be anticipated with the general revival of the industries, it is safe to assume that the required annual tonnage of Quebracho wood will be greatly enlarged, thereby reducing the existence of the present stands to 20 or possibly 25 years, unless energetic measures for the replacement of felled trees and the establishing of new forests in suitable places are adopted."

Products of the Quebracho tree will be found in Case 30, Museum I., and a railway-sleeper of the wood in Museum III. at Kew.—J. M. H.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6] [1923

## XIX.—REHMANN'S SOUTH AFRICAN MOSSES.

H. N. Dixon and A. Gepp.

Rehmann's Musci austro-africani were issued in two sets, the first between 1875 and 1877, comprising Nos. 1–423 (or ? 424); the second in or before 1886, containing Nos. 424 (or ? 425) to 680, which appears to conclude the series.

No list of these exsiccata appears to have been published; and it is doubtful whether a complete set is to be found in any collection. It appears desirable to have such a list for reference, and the following is an attempt to furnish it, so far as is possible from available material. It is based very largely on a MS. list drawn up by Dr. T. R. Sim from the sets of Rehmann's mosses in South African herbaria. Three sets are known to exist there, none of them at all complete, and none of them to any great extent duplicating the others; so that it would seem, as Dr. Sim suggests, as if one fairly full set had been divided between the herbaria in question.

How many actual numbers were issued it is difficult to compute; under many of the numbers two or more specimens were issued, as 665, 665B, 665C, &c., the supplementary numbers usually representing duplicates, or in many cases varieties, of the species in question. Dr. Sim was able to furnish copies of 615 labels, including supplementary numbers, which he computed to represent about 500 out of the full 680 or so primary ones. A careful search through the British Museum collection, and of at least the most important genera at Kew has resulted in the filling up of a considerable number of the missing labels, and it will be found that in the following list approximately 50 only are missing, though it is possible that a very small percentage must be added of supplementary numbers that may have been issued, as to which there is no clue.

There is, however, a strong probability that some of the missing numbers were never issued. Nos. 1–6, for instance, occur in none of the collections searched; the same is the case with Nos. 77–81. Rehmann may have left these gaps to be filled

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up later if more material were obtained. Or they may represent plants that he had in his herbarium, but of which he had not sufficient quantity to distribute.

Still, there are possibly a score or two of numbers probably issued but not occurring in any of the herbaria to which we have had access; and it is much to be hoped that the present publication may lead to further search, in herbaria possessing sets, which may result ultimately in the completion of the list. Any additions will be gratefully received.

The bulk of the labelling has been copied verbatim and literatim from Rehmann's lithographed labels. A certain number however of the S. African labels were abbreviated by Dr. Sim, when originally copied for his own use, as there was then no thought of publication; and in the case of one of the collections the labels were typed out for him by an assistant without technical knowledge, and errors have no doubt crept in. The bulk of these labels, however, have been verified (by A. G.) at the British Museum, and for the most part the data are exactly as given by Rehmann. The lithographed writing is by no means always easily legible; and the spelling of the same locality on different numbers is not always consistent. This accounts for some vicissitudes of spelling in the specific names which have given rise to a good deal of confusion; a notable example will be found under 42, *Campylopus Inczangae*. A few notes have been added on these and similar points.

It may be mentioned that Paris, who in the Index Bryologicus cites many, at least, of Rehmann's numbers, the unpublished species as well as the published ones, has made a good many errors, most of which we have been able to correct here. Moreover C. Mueller in the Contributiones ad Bryologiam austro-afram (Hedwig. xxxviii, 1899) has several errors in the numbers cited, most of which are copied by Paris. This is due, in several cases at least, to C. Mueller's citation of Rehmann's *collecting numbers* (as "Rehm. coll."), as if they were numbers of his Musci austro-africani, which he cites in the same manner.

These corrections give an additional reason for the publication of the list.

Rehmann's own herbarium might throw light on some of the missing numbers; but its present location is not known to us, and enquiries on the continent, and particularly at Cracow (where Rehmann was at one time a Professor of the University—cf. Rev. Bryol. 1878, p. 68), have hitherto failed to obtain the desired information.

The arrangement of the genera is that of Jaeger & Sauerbeck's Adumbratio. This fact reduces the problem of the missing numbers to within very narrow limits. The missing No. 112, *e.g.*, which comes in the middle of *Barbula*, would clearly belong to that genus; while No. 180, between *Entosthodon* and *Funaria*, would (if actually issued) as certainly belong to one or other of these genera.

A considerable number of the "new species" contained in these exsiccata have never been published. Some of them were identified by Rehmann himself with already described species, and reduced to synonymy on the labels of later numbers. Others have been reduced by subsequent writers, C. Mueller and—in the case of *Sphagna*—Warnstorf, especially; while in the course of a study of S. African mosses some others, both published and unpublished, have been found identical with previously described species. It has seemed desirable to add notes of such reductions; but it must not be assumed that any attempt has been made at a complete critical revision of the exsiccata. That is a piece of useful work remaining to be done, and one without which any attempt to compile a moss-flora of S. Africa would be quite premature. The present list is a necessary preliminary to such an attempt.

References to Dr. Rehmann's S. African Exsiccata will be found in the Revue Bryologique, 1878, p. 14; 1878, p. 68; 1880, p. 111; 1883, p. 76; 1886, p. 32.

The following abbreviations have been used.

Warnst., Sphag. Sphagnologia universalis, Warnstorf, 1911.
Broth., Musci Engler & Prantl., Pflanzenfamilien, Musci, V. F. Brotherus.

Notes and comments are placed in square brackets.

An asterisk preceding the name indicates that it is a published plant (though not necessarily under Rehmann's combination).

## Rehmann's Labels.

1
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6
7 ***Archidium Ecklonianum** *Hmpe.*—Cape Town.
8 ***Andraea subulata** *Harv.*—In Monte Tabulari.
[*Andreaea* recte]
9 ***Sphagnum coronatum** *C.M.* n.sp.—Montagu Pass.
9b***Sphagnum coronatum** *C.M.* n.sp.—Houtbay.
10 ***Sphagnum coronatum** *C.M.* var. **cuspidatum** *Rehm.*—In montibus supra Worcester.
[*S. coronatum* var. *cuspidatum* Rehm. fide Warnst., Sphag., p. 306; and *S. oxycladon* Warnst. op. et loc. cit.]
11 **Sphagnum coronatum** *C.M.* var **fluctuans** *Rehm.*—In mont. Heksriverberge loco "Axelsfarm" d.
12 ***Sphagnum Pappeanum** *C.M.*—Montagu Pass.
13 ***Sphagnum pycnocladulum** *C.M.* n.sp.—Montagu Pass.
14 ***Sphagnum oligodon** *Rehm.* n.sp.—Natal: Inanda.
14b***Sphagnum oligodon** *Rehm.* n.sp.—Natal: Vildshill.
15 ***Sphagnum panduraefolium** *C.M.* n.sp.—In Monte Tabulari.

16 ***Sphagnum austro-molle** *C.M.* n.sp.—Stinkwater.
[*S. panduraefolium* C.M. *fide* Rehm. sub No. 433.
*S. capense* Hornsch., *fide* Warnst., Sphag., p. 427]

16b***Sphagnum austro-molle** *C.M.* n.sp.—Montagu Pass.
[*S. capense* Hornsch. *fide* Warnst., Sphag., p. 427]

16c***Sphagnum austro-molle** *C.M.* n.sp.—Montagu Pass.
[*S. panduraefolium* C.M. *fide* Rehm. sub No. 433.
*S. capense* Hornsch., *fide* Warnst., Sphag., p. 427]

17 ***Sphagnum mollissimum** *C.M.* n.sp.—Montagu Pass.
[*S. pycnocladulum* C.M. *fide* Warnst., Sphag., p. 427.]

17b***Sphagnum mollissimum** *C.M.* n.sp.—Montague Pass.

17c***Sphagnum mollissimum** *C.M.* n.sp.—Montagu Pass.

18 ***Sphagnum mollissimum** *C.M.* n.sp. var. **elongatum** *Rehm.*—Stinkwater.
[*S. capense* Hornsch. *fide* Warnst., Sphag., p. 427]

19 ***Gymnostomum oranicum** *Rehm.* n.sp.—Orange Free State: Bloemfontein.
[*Weisia oranica* (Rehm.) C.M. *fide* Dixon in Journ. of Bot. lvii, 75. It is peristomate]

20 **Weissia viridula** var. **sclerodonta** *Hmpe.*—Rondebosh.

21 **Weissia viridula** var. **tortilis** *Spr.*—Cape Town.

22 **Trematodon ligulatus** *Rehm.* n.sp.—Natal: Oakfort [? Oakport].

23 **Trematodon tortilis** *Rehm.* n.sp.—Natal: Oakfort.

24 ***Dicranella subcompressa** (*Hmpe*) *Schp.*—Montagu Pass.
[*Aongstroemia subcompressa* Hpe. *Aongstroemia* sensu stricto, *fide* Brotherus, Musci]

25 ***Dicranella abruptifolia** (*C.M.* n.sp.) *Rehm.*—Esternek supra Knysna.

26 ***Leucoloma Eckloni** *Lrtz.*—Houtsbay.

27 ***Leucoloma Zeyheri** *C.M.*—In Monte Tabulari.

28 ***Leucoloma Zeyheri** var. **compactum** *C.M.*—In Monte Tabulari.

29 ***Leucoloma Rehmanni** *C.M.* n.sp.—In umbrosis ad Clermont. [Published as *Dicranum Rehmanni* C.M. in Hedwig. xxxviii, 87]

29b***Leucoloma Rehmanni** *C.M.* n.sp.—In sylvis Knysnae.
[In Par. Ind., ed. 2, sub *L. Rehmanni* for 296 read 29b]

30 ***Leucoloma Sprengelianum** *C.M.*—In Monte Tabulari.

31 **Dicranum commutatum** *Hpe.*—In sylvis Knysnae.
[*Dicranoloma Billardieri* (Schwaegr.) Par. *fide* Dixon in Journ. of Bot. 1916, p. 356]

32 **Dicranum tabulare** *Rehm.* n.sp.—In Monte Tabulari.
[*Dicranoloma Billardieri* (Schwaegr.) Par. *fide* Dixon, op. cit., p. 357]

33 ***Campylopus leptotrichaceus** *C.M.* n.sp.—In silvis Knysnae.
[This and others of Rehmann's numbers were published as species of *Dicranum* by C.M. in Hedwig. xxxviii]

34 ***Campylopus nanus** *C.M.*—Rondebosh.

35 **Campylopus tenellus** *Rehm.* n.sp.—Cape Town.

36 **Campylopus mollis** *Rehm.* n.sp.—Natal: Inanda.
37 **Campylopus bartramiaceus** *C.M.* n.sp.—Cape Town.
38 **Campylopus Sudabyanus** *Rehm.* n.sp.—Orange Free State: Kadziberg.
39 **Campylopus Schunkei** *Rehm.* n.sp.—Montagu-pass.
40 **Campylopus longescens** *C.M.* n.sp.—In silvis Knysnae.
[= *C. clavatus* (R.Br.) H.f. & W. *fide* H.N.D.]
41 ***Campylopus longescens** *C.M.* var. **firmus** Rehm.—In silvis Knysnae.
42 ***Campylopus Inczangae** Rehm. *n.sp.*—Natal: Inczanga.
[*Dicranum Inerangae* C.M. in Hedwig. xxxviii. 83, *errore*. *C. Imerangae* Par. Ind. ed. 2, *errore*. Cf. Dixon in Trans. Roy. Soc. S. Afr:, viii, 85]
43 ***Campylopus Inandae** *Rehm.* n.sp.—Natal: Inanda.
44 **Campylopus brevis** *Rehm.* n.sp.—Stinkwater.
[= *C. atro-luteus* (C.M.) *fide* C.M. in Hedwig. xxxviii, 81]
45 ***Campylopus semidorsum** *C.M.* n.sp.—In Monte Tabulari.
[Published by C.M. in Hedwig. xxxviii, 84, as *Dicranum serridorsum*, which no doubt was intended]
46 ***Campylopus chlorophyllosus** *C.M.* typus!—In Monte Tabulari.
46b***Campylopus chlorophyllosus** *C.M.* typus!—Houtbay.
47 **Campylopus chlorophyllosus** *C.M.* var. **tristis** *Rehm.*—Devilspeak.
48 **Campylopus chlorophyllosus** *C.M.* var. **vivularis** *Rehm.*—In Monte Tabulari.
[*vivularis* is an obvious slip for *rivularis*]
49 **Campylopus chlorophyllosus** *C.M.* var. **compactus** *Rehm.*—Montagu pass.
50 **Campylopus silvaticus** *Rehm.* n.sp.—In silvis supra Blanco.
51 **Campylopus natalensis** *Rehm.* n.sp.—Natal: Van Reenen pass.
[= *C. nano-tenax* (C.M.) *fide* C.M. in Hedwig. xxxviii. 83]
52 ***Campylopus stenopelma** *C.M.* n.sp.—In silvis Knysnae.
53 **Campylopus chlorotrichus** *C.M.* n.sp.—Montagu pass.
53b **Campylopus chlorotrichus** *C.M.* n.sp.—In silvis Knysnae.
54 ***Campylopus tenax** *C.M.* n.sp.—In silvis ad Blanco.
55 ***Campylopus subbartramiaceus** *C.M.* n.sp.—Cape Town.
[In Par. Ind., Ed. 2, sub *C. leucobasis* var. *bartramiaceus*, for n. 32 read n. 55.]
56 ***Campylopus trichodes** *Lrtz.*—Cape Town.
56b***Campylopus trichodes** *Grev.*—Orange Free State: Kadziberg.
[Grev. is an error for Lorentz.]
57 **Campylopus turgidus** *Rehm.* n.sp.—Orange Free State: Kadziberg.
58 **Campylopus julaceus** *Rehm.* n.sp.—Orange Free State: Kadziberg.
[Name altered to *C. pseudo-julaceus* by Paris in view of *C. julaceus* (Hampe) Jaeg.]

59 **Campylopus hygrometricus** *Rehm.* n.sp.—Orange Free State: Liebenbergsvley.
[= *C. purpureo-aureus* (C.M.) *fide* C.M. in Hedwig. xxxviii, 82.]

60 ***Campylopus ampliretis** *C.M.* n.sp.—Montagu Pass.
[Is a *Thysanomitrium fide* Thériot in litt. The Kew specimen, and others, read *C. ampliretis* Rehm. n.sp.]

61 ***Campylopus weissiopsis** *C.M.* n.sp.—Cape Town.

62 ***Campylopus pulvinatus** *Rehm.* n.sp.—Stinkwater.

63 ***Campylopus atro-luteus** *C.M.* n.sp.—In Monte Tabulari.

64 ***Campylopus catharractitis** *C.M.* n.sp.—ad Catharractam supra Rondebosh.
[*catharractitis* is an obvious slip for *catharractilis*. The name was published as *catarractilis*.]

65 **Campylopus Marillacii** *Rehm.* n.sp.—Montagu pass.

66 ***Campylopus lepidophyllus** *C.M.*—Cape Flats.

67 **Campylopus echinatus** *Rehm.* n.sp.—Cape Town.
[= *C. introflexus* Brid. *fide* H.N.D.]

68 **Campylopus echinatus** var. **brevipilus** *Rehm.*—Cape Town.

69 **Campylopus echinatus** var. **turgescens** *Rehm.*—Campsbay.

70 **Campylopus echinatus** var. **vallis-gratiae** *Hmpe.*—In silvis Knysnae.
[= *C. leucobasis* (C.M.) var. *longescens fide* C.M. in Hedwig. xxxviii, 79]

71 **Campylopus echinatus** var. **leucobasis** (*C.M.* n.sp.) *Rehm.*—Montagu pass.
[= *C. leucobasis* (C.M.) *fide* C.M. in Hedwig. xxxviii, 79 ]

72 **Campylopus echinatus** var. **umbrosus** *Rehm.*—In silvis Knysnae.

73 **Holomitrium capense** *C.M.* n.sp.—In silvis Knysnae.

74 ***Leucobryum Guinzii** *C.M.* n.sp.—Montagu pass.
[Paris, sub *L. Gueinzii* cites No. 75 as well as 74, erroneously.]

75 ***Leucobryum Rehmanni** *C.M.* n.sp.—In silvis Knysnae ad Esternek.

76 ***Tetrapterum capense** *Harv.*—Cape Town.
[= *Systegium tetragonum* (Harv.) Par. Ind. Ed. 2.]

77 *[An unnumbered label at Kew, belonging to the first Collection "**Dicranodontium perfalcatum** *C.M.* n.sp.—In silvis Knysnae ad Esternek" almost certainly belongs to this or one of the following vacant numbers.]

78

79

80

81

82 ***Didymodon fontanus** *Rehm.* n.sp.—Natal: Van Reenen Pass.
[Published as *Trichostomum afro-fontanum* C.M. in Hedwig. xxxviii, 99. C.M. attributes this name to Rehmann, but apparently without authority.]

83 **Didymodon Knysnae** *Rehm.* n.sp.—Knysna.
84 ***Leptotrichum capense** *C.M.*—Rondebosh.
[= *Ditrichum flexifolium* (Hook.) Hampe, *fide* Dixon in Journ. of Bot. 1913, p. 326.]
84b***Leptotrichum capense** *C.M.*—Clermont.
84c***Leptotrichum capense** *C.M.*—In silvis Knysnae.
85 ***Leptotrichum capense** *C.M.* var. **Vallis Gratiae** *Hmpe.*—Montagu pass.
86 ***Leptotrichum dolichopodum** *Rehm.* n.sp.—Orange Free State: Kadziberg.
[Published as *Leptotrichum brachypodum* C.M. in Hedwig. xxxviii, 89.]
87 ***Barbula muralis** *L.*—Cape Town.
88 ***Barbula muralis** var. **brevipedunculata** *C.M.*—Montagu pass.
89 ***Barbula recurvata** *Hook.*—Cape Town.
[= *Tortula atrovirens* (Sm.) Lindb. *fide* Wils. MS. in Herb., et H.N.D.]
90 **Barbula recurvata** var. **aristatula** *C.M.*—Cape Town.
[See note on No. 89.]
91 ***Barbula Eutrichostomum** *C.M.* n.sp.—In collibus supra Blanco.
92
93
94 ***Barbula xanthocarpa** *C.M.*—Cape Town.
95 ***Barbula Laureri** *Lrtz.*—Cape Town.
96 ***Barbula desecta** *C.M.* n.sp.—Cape Town.
[*desecta* should be *deserta*. Published as *Barbula deserta* C.M. in Hedwig. xxxviii, 108.]
97 ***Barbula trichostomacea** *C.M.* n.sp.—Rondebosh.
98 ***Barbula trichostomacea** *C.M* var. **chlorophyllosa** *C.M.*—Cape Town.
99 ***Barbula trichostomacea** *C.M.* var. **chlorophyllosa** *C.M.*—Orange Free State: Kadziberg.
[C.M. cites this number, but not 98, as a synonym of his *B. trivialis*, in Hedwig. xxxviii, 107.]
100 **Barbula Basutensis** *Rehm.* n.sp.—Basutoland: ad riv. Caledon.
[Placed under *Hyophila* by Rehmann sub Nos. 458, 459.]
101 ***Barbula Rehmanni** *C.M.* n.sp.—Ad ostia flum. Towriver.
102 ***Barbula dimorpha** *C.M.* n.sp.—Cape Town.
[*Didymodon dimorphus* (C.M.) Broth., Musci, p. 407.]
103 **Barbula plicata** *Rehm.* n.sp.—Basutoland: ad riv. Caledon.
[C. Mueller's reference to this No. sub *Bryum porphyreothrix*—Hedwig. xxxviii, 70,—is an error.]
104 ***Barbula natalensis** *Rehm.* n.sp.—Natal: Port Durban.
[= *Barbula indica* Brid. *fide* Dixon in S. Afr. Journ. of Sci. xviii, 313.]
105 **Barbula torquescens** *Schp.*—Cape Town.
[The Kew specimen (and others presumably) is a totally

different thing from *B. torquescens* Schimp.; possibly *B. unguiculatula* Broth. MS., or near it.]

106 ***Barbula reticularia** *C.M.* n.sp.—Cape Town.

107 ***Barbula brachyachme** *C.M.* n.sp.—Cape Town.

108 **Barbula Bokkefeldiana** *Rehm.* n.sp.—Lionsfontein in mont. Bokkefeld.
[= *Tortula pilifera* Hook. *fide* H.N.D.]

109 **Barbula Mauchii** *Rehm.* n.sp.—In mont. supra Worcester.
[= *B. torquescens* Schimp. *fide* C.M. in Hedwig. xxxviii, 105; i.e. *Tortula pilifera* Hook. *fide* H.N.D.]

110 ***Barbula pilifera** *Hook.*—Cape Town.
[Fleischer is certainly right in restoring this species to *Tortula*.]

110b***Barbula pilifera** *Hook.*—Table Mountain.

110c***Barbula pilifera** *Hook.*—Orange Free State: Bethlehem.

111 **Barbula pilifera** var. **aquatilis** *C.M.*—Ad catharractam supra Rondebosh.

112

113 **Barbula pilifera** *Hook.* var. **senilis** *Rehm.*—Cape Town.

114 ***Barbula afro-ruralis** *C.M.* n.sp.—Stinkwater.

115 ***Trichostomum rufisetum** *C.M.* n.sp.—In collibus supra Blanco.
[*Tortella rufiseta* (C.M.) Broth. Musci, p. 397.]

116

117 **Trichostomum oocarpum** *Rehm.* n.sp.—Orange Free State: Kadziberg.

118 **Trichostomum Bainsii** *Rehm.* n.sp.—Orange Free State: Kadziberg.

119 ***Trichostomum atro-virens** *Rehm.* n.sp.—Natal: Van Reenen Pass.

120 ***Trichostomum afro-phaeum** *Rehm.* n.sp.—Orange Free State: Bethlehem.
[Published as *Pottia afro-phaea* C.M. in Hedwig. xxxviii, 97.]

121 **Trichostomum riparium** *Rehm.* n.sp.—Natal: Drakensberg: Van Reenen Pass.

122 ***Ceratodon corsiceus** *C.M.*—In Monte Tabulari.
[*corsiceus*, error for *corsicus*. C.M. in Hedwig. xxxviii, 98, apparently cites some of these plants as *C. conicus* (Spreng.), but there is nothing to show whether *corsicus* is a slip of Rehmann's or whether C.M. in 1899 had changed his view. In any case both *C. conicus* and *C. corsicus* are but little more than forms of *C. purpureus*.]

122b***Ceratodon corsicus** *C.M.*—Rondebosh.

122c***Ceratodon corsicus** *C.M.*—Montagu Pass.

123 ***Syrrhopodon pomiformis** *Hmpe.*—In Monte Tabulari.

123b***Syrrhopodon pomiformis** *Hmpe.*—Montagu Pass.

124 **Syrrhopodon pomiformis** var. **truncicola** *Rehm.*—Montagu Pass.

125 ***Syrrhopodon Dregei** *Hrnsch.*—In rupibus ad Camps Bay.

126 **Syrrhopodon obscurus** *Rehm.* n.sp.—Orange Free State: Bethlehem.
[Referred by C.M. in Hedwig. xxxviii, 104 to *Barbula oranica* C.M., i.e. *Tortula erubescens* (C.M.) *fide* Dixon in Smithson. Misc. Colls. 69 : 14.]

127 **Syrrhopodon pyriformis** *C.M.*—In silvis Knysnae.
[See note on No. 488.]

128 ***Syrrhopodon erectifolius** *C.M.* n.sp.—Montagu Pass.

129 ***Syrrhopodon uncinifolius** *C.M.* n.sp.—Montagu Pass.

129b***Syrrhopodon uncinifolius** *C.M.* n.sp.—Natal : Inanda.

130 ***Grimmia caffra** *Rehm.* n.sp.—Orange Free State : Witteberge supra Kadziberg.

131 ***Grimmia apocarpa** *Hedw.*—Bethlehem.
[This and the following number form the type of *Grimmia oranica* C.M. in Hedwig. xxxviii, 121.]

132 ***Grimmia apocarpa** var. **stricta** *Rehm.*—Orange Free State : Kadziberg.
[See note on No. 131.]

133 ***Grimmia Eckloni** *Spr.*—Cape Town.
[= *Grimmia pulvinata* (L.) *fide* Brotherus, Musci, p. 451.]

133b***Grimmia Eckloni** *Spr.*—Orange Free State : Bloemfontein.

134

135 ***Grimmia campestris** *Burch.*—Cape Town.

135b***Grimmia campestris** *Burch.*—Orange Free State : Bloemfontein.

136

137 ***Grimmia austro-patens** *C.M.* n.sp.—In Monte Tabulari.
[= *Rhacomitrium crispulum* (H. f. & W.) H. f. & W., *fide* H.N.D.]

138 ***Grimmia austro-patens** *C.M.* n.sp. *forma.*—In Monte Tabulari.
[See note on No. 137.]

139 ***Grimmia nigro-viridis** *C.M.* n.sp.—In Monte Tabulari.

139b***Grimmia nigro-viridis** *C.M.* n.sp.—In montibus supra Worcester.

139c***Grimmia nigro-viridis** *C.M.* n.sp.—Devilspeak.

140 ***Rhacomitrium incanum** *C.M.*—In Monte Tabulari.
[= *Rhac. hypnoides* (L.) *fide* Broth. Musci, p. 451.]

141 ***Ptychomitrium crispatum** *Hrnsch.*—Cape Town.

141b***Ptychomitrium crispatum** *Hrnsch.*—Natal : Drakensberg ad Van Reenen Pass.

142 ***Ptychomitrium cucullatifolium** *C.M.*—Orange Free State : Bloemfontein.

142b***Ptychomitrium cucullatifolium** *C.M.*—Orange Free State : in montib. Witteberge.

143 **Amphoridium africanum** *Rehm.* n.sp.—Orange Free State : Witteberge supra Kadziberg.

144 ***Zygodon strictissimus** *Rehm.* n.sp.—Wellington.
[Published as *Triquetrella strictissima* (Rehm.) C.M.]

145 *__Zygodon tristichus__ *C.M.*—Camps Bay.
[= *Triquetrella tristicha* C.M.]
145b*__Zygodon tristichus__ *C.M.*—In Monte Tabulari.
145c*__Zygodon tristichus__ *C.M.*—Heksrivermountain.
146 __Zygodon subcyathicarpus__ *C.M.* n.sp.—Ad catharractam Montis Diaboli.
[= *Amphidium cyathicarpum* (Mont.) *fide* H.N.D.]
147 *__(Zygodon leptobolax)__.
[We have not seen this, but see Rehmann sub No. 499.]
148 *__Zygodon perreflexus__ *C.M.* n.sp.—Rondebosh, ad arborum truncos.
149 __Zygodon Rehmanni__ *C.M.* n.sp.—In silvis Knysnae.
[=*Zygodon trichomitrius* H. f. & W. *fide* C.M. in Hedwig. xxxviii, 115.]
150 *__Zygodon runcinatus__ *C.M.* n.sp.—In Monte Tabulari.
150b*__Zygodon runcinatus__ *C.M.* n.sp.—Devilspeak.
151 *__Zygodon rugifolius__ *C.M.* n.sp.—Devilspeak.
[Published as *Macromitrium rugifolium* C.M. in Hedwig. xxxviii, 115. *Coleochaetium rugifolium* Broth. The name *Leiomitrium* however antedates *Coleochaetium*, as Cardot has shown, Mousses de Madagascar, p. 230.]
152 *__Schlotheimia exrugulosa__ *C.M.* n.sp.—In Monte Tabulari.
153 *__Schlotheimia rufo-glauca__ *C.M.* n.sp.—In silvis Knysnae prope Portland.
154 *__Schlotheimia rufo-pallens__ *C.M.* n.sp.—In silvis supra Blanco.
155 *__Schlotheimia cuspidata__ *C.M.* n.sp.—Montagu Pass.
[Published as *S. percuspidata* C.M. in Hedwig. xxxviii, 117.]
156 __Schlotheimia cuspidata__ var. __brevipedunculata__ *Rehm.*—Montagu Pass.
157 __Dasymitrium Rehmanni__ *C.M.* n.sp.—In silvis Knysnae ad arborum truncos.
[= *Macromitrium serpens* (Hook. & Grev.) Brid. *fide* C.M. in Hedwig. xxxviii, 116.]
158 *__Macromitrium Dregei__ *Hrnsch.*—In silvis Knysnae ad arborum truncos.
159 __Macromitrium caespitans__ *C.M.* n.sp.—Camps Bay.
[= *Macromitrium tenue* Brid. *fide* C.M. in Hedwig. xxxviii, 116.]
159b __Macromitrium caespitans__ *C.M.* n.sp.—In Monte Tabulari.
160 *__Macromitrium dawsoniomitrium__ *C.M.* n.sp.—In silvis Knysnae.
161 *__Macromitrium tenue__ *Brid.*—Natal: Inanda: in ramis arborum.
162 __Macromitrium tenue__ var. __brachypus__ *C.M.*—Clermont.
163 __Macromitrium tenue__ var. __leptocladus__ *C.M.*—Devilspeak in arborum truncis.
164 *__Macromitrium pulchellum__ *Brid.*—Devilspeak.
165 *__Macromitrium lycopodioides__ *Schwgr.*—In silvis supra Clarmont.

165b*Macromitrium lycopodioides *Schwgr.*—In Monte Tabulari.
166 *Macromitrium lycopodioides *Schwgr. forma.*—In Monte Tabulari.
167 *Macromitrium macropelma *C.M.*—In silvis Knysnae.
168 *Macromitrium secundum *C.M.*—Stinkwater.
168b*Macromitrium secundum *C.M.*—Houtbay.
168c*Macromitrium secundum *C.M.*—Montagu Pass.
169 *Orthotrichum glaucum *Spr.*—
[No locality is given.]
170 *Orthotrichum subexsertum *Schp.*—Cape Town.
171 *Sphaerangium africanum *Rehm.* n.sp.—Orange Free State: Bloemfontein.
[Published as *Rehmanniella africana* C.M. *Goniomitrium africanum* Broth., Musci, p. 521. See also No. 518.]
172 *Entostodon Bergianus *Hrnsch.*—Cape Town.
[For Entosthodon, as in the following numbers.]
173 [Dr. Sim has an unnumbered label "**Entostodon Bergianus** var. **minor.**—Cape Town", which probably represents this No.]
174 *Entostodon ampliretis *Rehm.* n.sp.—Natal: Umgeni supra Maritzburg.
175 *Entostodon micropyxis *C.M.* n.sp.—In silvis supra Blanco.
176 Entostodon crassipes *Rehm.* n.sp.—Karroo, ad rip. flum. Gamkoo.
177 Entostodon chlorophyllosus *Rehm.* n.sp.—Orange Free State: Kadziberg.
178 Entostodon Kadzianus *Rehm.* n.sp.—Orange Free State: Kadziberg.
179 *Entostodon clavatus *Mitt.*—Cape Town.
180
181 *Funaria lonchopelma *C.M.* n.sp.—Montagu Pass.
182 *Funaria hygrometrica *H.*—In Monte Tabulari.
182b*Funaria hygrometrica *H.*—Houtbay.
183
184 *Glyphocarpus aristarius *C.M.* n.sp.—Montagu Pass.
[*Breutelia aristaria* (C.M.) Broth., Musci, p. 657.]
184b*Glyphocarpus aristarius *C.M.* n.sp.—In Monte Tabulari.
184c*Glyphocarpus aristarius *C.M.* n.sp.—Worcester.
185 Glyphocarpus aristarius var. **plumosus** *Rehm.*—Natal: Inanda.
186 *Glyphocarpus Hymenodon *C.M.*—Devilspeak: ad catharractam.
187 Glyphocarpus pilulifer *C.M.* n.sp.—Montagu Pass.
[C.M. in Hedwig. xxxviii, 90, has referred to *Bartramia comosa* three of Rehmann's specimens, but the numbers do not agree with the labels. Presumably the No. 83 (in Hedwig.) should be 188, 86 should be 187, and 132 should be 189. It is *Bartramidula comosa* Broth. Musci, p. 644.]
188 *Glyphocarpus comosus *Hmpe. et C.M.*—Montagu Pass.
189 Glyphocarpus comosus var. **nanus** *C.M.*—Montagu Pass.

190 **Glyphocarpus pseudocomosus** *Rehm.* n.sp.—Orange Free State : Kadziberg.

191 ***Glyphocarpus pernanus** *C.M.* n.sp.—Knysna : supra Belveder.
[Published as *Bartramia pernana* C.M. in Hedwig. xxxviii, 92.]

192 ***Philonotis Oraniae** *Rehm.* n.sp. Ad ripas fl. Caledon : pr. Kadziberg.
[Published as *Bartramia afro-fontana* C.M. in Hedwig. xxxviii, 93.]

193 ***Philonotis africana** *Rehm.* n.sp.—Natal : Inanda.
[Published as *Bartramia africana* C.M. in Hedwig. xxxviii, 93.]

193b***Philonotis africana** *Rehm.* n.sp.—Cape Town.

194 ***Philonotis subcordata** *Rehm.* n.sp.—Natal : Inanda.
[*Breutelia aristaria* (C.M.) Broth. *fide* C.M. in Hedwig. xxxviii, 93.)

195 **Philonotis hyophila** *Rehm.* n.sp.—Orange Free State : Kadziberg.

196 **Philonotis molmonica** *Rehm.* n.sp.—Orange Free State : Molmonspruit.

197 **Philonotis Natalensis** *Rehm.* n.sp.—Natal : Inczanga.

198 **Bartramia asperrima** *Hmpe.*—In Monte Tabulari.
[*Glyphocarpa asperrima* Hampe MS. = *B. Hampeana* C.M. It is not clear why Rehmann keeps both names—cf. No. 200.]

199 ***Bartramia subasperrima** *C.M.* n.sp.—Cape Town.

200 ***Bartramia Hampeana** *C.M.*—In Monte Tabulari.

201 **Bartramia vaginans** *Rehm.* n.sp.—Orange Free State : Caledon river prope Kadziberg.

201b **Bartramia vaginans** *Rehm.* n.sp. *forma.*—Kadziberg.

202 **Bartramia marginalis** *Rehm.* n.sp.—Orange Free State : Kadziberg.

203 ***Bartramia afro-stricta** *C.M.* n.sp.—Cape Town.
[= *B. substricta* Schimp. *fide* H.N.D.]

204 ***Bartramia afro-stricta** *C.M.* n.sp. *forma.*—Cape Town.
[See note on No. 203.]

205 ***Bartramia afro-stricta** *C.M.* n.sp. *forma.*—Worcester.

206 **Bartramia laete-virens** *Rehm.* n.sp.—In montibus supra Worcester.
[= *Breutelia afro-scoparia* (C.M.) Par.]

207 **Bartramia laete-virens** var. **procera.**—Bokkefeld : Lionsfontein.
[See note on No. 206.]

208 ***Mielichhoferia pellucida** *Hmpe.*—Rondebosh.

209 ***Mielichhoferia pellucida** *Hmpe. forma.*—Campsbay.

210 **Mielichhoferia squarrosula** *C.M.* n.sp.—Campsbay.
[Is this the *M. squarrulosa* of C.M. in Hedwig. xxxviii, 64 ?]

211

212 **Mielichhoferia elongata** *Rehm.* n.sp.—Natal - Van Reenen Pass.
[This name however is pre-occupied by *M. elongata* (Hornsch.) Bry. Germ.]

213
[C.M. in Hedwig. xxxviii, 95, cites this No. for *Bartramia subasperrima*; but this must be a slip, as that genus would be out of place here. It should no doubt be No. 191.]

214 ***Mielichhoferia procerrima** *Rehm.* n.sp.—In Mont. Witteberge: supra Kadziberg.
[Published as *Bryum promontorii* C.M. in Hedwig. xxxviii, 69. *Anomobryum promontorii* (C.M.) Dixon in Trans. Roy. Soc. S. Afr. viii, 101.]

215 ***Leptochlaena Rehmanni** *C.M.* n.sp.—Devilspeak supra Catharractam.
[Published as *Mielichhoferia Rehmanni* C.M. in Hedwig. xxxviii, 64.]

216 **Leptochlaena Rehmanni** *C.M.* n.sp. var. **oranica** *Rehm.*—In Mont. Witteberge supra Kadziberg.

217 ***Brachymenium pulchrum** *Hook.*—In silvis supra Blanco.

218 ***Brachymenium Koratranum** *C.M.*—In silvis supra Blanco.
[= *B. pulchrum* Hook. *fide* Dixon in Trans. Roy. Soc. S. Afr. viii, 200.]

218b***Brachymenium Koratranum** *C.M.*—In silvis supra Blanco.

219 ***Brachymenium dicranoides** *Hrnsch.*—Ad muros prope Rondebosh.

220 ***Brachymenium stenopyxis** *C.M.* n.sp.—Cape Town.
[Published as *Bryum liliputanum* C.M. in Hedwig. xxxviii, 66; where *steropyxis* is a slip for *stenopyxis*, and No. 241 represents a herbarium number of Rehmann's, not the exsiccata No.]

221 ***Webera austro-nutans** *C.M.* n.sp.—Montagu Pass.
[Published as *Bryum afro-nutans* C.M. in Hedwig. xxxviii, 76. Paris has introduced unnecessary confusion into the nomenclature, sub *Webera*; but as Brotherus, Musci p. 549, has reduced both *Bryum austro-nutans* C.M. (Kerguelen) and *B. afro-nutans* to *Pohlia nutans* (Schreb.), it seems unnecessary to elucidate it here.]

222 ***Webera mielichhoferiacea** *C.M.* n.sp.—Devilspeak.
[Published as *Bryum mielichhoferiaceum* C.M. in Hedwig. xxxviii, 75.]

223 **Webera Enselini** Rehm. n.sp.—In Montibus supra Worcester.
[Or *Enselmi ?*]

224 **Webera brachymeniacea** *C.M.* n.sp.—Rondebosh : ad arborum radices.
[= *Mielichhoferia vallis-gratiae* Hampe *ex parte, fide* Rehm. sub No. 542. The true *W. brachymeniacea* is issued as No. 553.]

225 **Webera glandiformis** *Rehm.* n.sp.—Cape Town.

226 **Bryum integrifolium** *Rehm.* n.sp.—Natal: Van Reenen Pass.
[= *Bryum leucothrix* C.M. in Hedwig. xxxviii, 69, *fide* Rehm. sub Nos. 554, 554b.]

227

228 **Bryum syntrichioides** *C.M.* n.sp.—In silvis supra Blanco.
[This and the subsequent Nos. under *B. syntrichioides* (excl. 228c) belong to *B. truncorum* Bory, *fide* Dixon in S. Afr. Journ. of Sci. xviii, 322.]

228b **Bryum syntrichioides** *C.M.* n.sp.—Orange Free State: Kadziberg.

228c **Bryum syntrichioides** *C.M.* n.sp. *forma.*—Natal: Van Reenen Pass.
[= *B. truncorum* var. *pycnophyllum* Dixon in S. Afr. Journ. of Sci. xviii, 322.]

229 **Bryum chrysoloma** *C.M.* n.sp.—Campsbay.

230 **Bryum argutidens** *Rehm,* n.sp.—Natal: Inczanga.

231 **Bryum syntrichiaefolium** *C.M.* n.sp.—Rondebosh.

232 ***Bryum capillare** var. **capense** *Hmpe.*—Stinkwater.

233 **Bryum ochropyxis** *C.M.* n.sp.—Houtbay.

234 **Bryum Rehmanni** *C.M.* n.sp.—Montagu Pass: ad pontem.

235 **Bryum aterrimum** *C.M.* n.sp.—Ad viam inter Knysna et Belveder.

236 **Bryum Haanii** *Rehm.* n.sp.—Orange Free State: Kadziberg.

237

238

239 **Bryum pycnoloma** *C.M.* n.sp.—Devilspeak: ad catharractam.

240

241 **Bryum schizotrichum** *C.M.* n.sp.—Cape Town.

242 ***Bryum porphyrotrix** *C.M.* n.sp.—In umbrosis prope Blanco.
[This is no doubt the *Bryum porphyreothrix* C.M. in Hedwig. xxxviii, 70, though C.M. does not cite this No.]

243

[We have not seen this, but Par. Ind. makes it clear that the labelling was "**Bryum dimorphum** *C.M.* n.sp.",—altered by Paris to *B. afro-dimorphum* on account of *B. dimorphum* (C.M.) Broth. The locality was probably not specified, as Paris gives only Afr. austr.]

244 **Bryum monilicaule** *C.M.* n.sp.—Cape Town.

245 **Bryum radicale** *Rehm.* n.sp.—Orange Free State: Bethlehem.

246 ***Bryum decursivum,** *C.M.* n.sp.—Cape Town.
[Published in Hedwig. xxxviii, 70; but name altered to *B. pseudo-decursivum* by Paris owing to the name being ante-dated by *B. decursivum* C.M. (1898).]

247 **Bryum afro-turbinatum** *Rehm.* n.sp.—In Mont. Witteberge supra Kadziberg.

247b **Bryum afro-turbinatum** *Rehm.* n.sp.—Orange Free State: Bethlehem.

248 ***Bryum afro-alpinum** *Rehm.* n.sp.—Orange Free State: Kadziberg.

248b***Bryum afro-alpinum** *Rehm.* n.sp. sterile.—Orange Free State: Kadziberg.

248c***Bryum afro-alpinum** *Rehm.* n.sp.—Natal: Inczanga.

249 **Bryum amplirete** *Rehm.* n.sp.—Orange Free State: Kadziberg.

250 **Bryum porphyroloma** *C.M.* n.sp.—Devilspeak: ad catharractam.

250b **Bryum porphyroloma** *C.M.* n.sp.—Orange Free State: Kadziberg.

251 **Bryum tenerrimum** *Rehm.* n.sp.—Devilspeak: ad catharractam.

252 **Bryum bulbilliferum** *Rehm.* n.sp.—Cape Town.

253 ***Bryum laxe-gemmaceum** *C.M.* n.sp.—In umbrosis supra Blanco.

254 ***Bryum subdecursivum** *C.M.* n.sp.—Cape Town.

255 **Bryum cavifolium** *Rehm.* n.sp.—Campsbay.
[*Bryum subcavifolium* Par. Ind. Ed. 2.]

256 **Bryum leptotrichaceum** *Rehm.* n. sp.—Orange Free State: Kadziberg.

257 **Bryum bartramioides** *Rehm.* n.sp.—Orange Free State: Kadziberg.

258

259 ***Bryum argenteum** *L.*—Cape Town.
[The label bears the No. 257; but this is an error, as shown by the citation of *B. argenteum* under the present No. by C.M. in Hedwig. xxxviii, 68, line 10. The true 257 is *B. bartramioides* above.]

260 ***Bryum argenteum** var. **australe** *Rehm.*—Orange Free State: Kadziberg.
[Published as *B. oranicum* C.M. in Hedwig. xxxviii, 68. The same form occurs in S. India, and it is better retained as a var. of *B. argenteum*.]

261 ***Mnium Eckloni** *C.M.* c. fl. ♂.—Natal: Van Reenen Pass.
[= *M. rostratum* Schrad. *fide* Broth., Musci, p. 610.

261b***Mnium Eckloni** *C.M.*—Orange Free State: Kadziberg.

261c***Mnium Eckloni** *C.M.*—Devilspeak: ad catharractam.

262 ***Rhizogonium spiniforme** *Brch.*—In silvis Knysnae.

263 ***Rhizogonium Vallis Gratiae** *Hmpe.*—Houtbay.

263b***Rhizogonium Vallis Gratiae** *Hmpe.*—Devilspeak.

263c***Rhizogonium Vallis Gratiae** *Hmpe.*—Newlands.
[N.B. 263c *Fissidens glaucescens*, on some labels, is an error for 283c.]

263d***Rhizogonium Vallis Gratiae** *Hmpe.*—In montibus supra Worcester.

263e***Rhizogonium Vallis Gratiae** *Hmpe.*—In montibus supra Worcester.

264 **Atrichum nudifolium** *C.M.* n.sp.—In silvis supra Blanco.
265 ***Atrichum androgynum** *C.M.*—In silvis Knysnae.
266 **Atrichum polyphyllum** *Rehm.* n.sp.—Natal : Inczanga.
[= *A. androgynum* C.M. fide C.M. in Hedwig. xxxviii, 64.]
267 ***Pogonatum capense** *Hmpe.*—Natal : Inczanga.
268 **Pogonatum tortifolium** *Rehm.* n.sp.—Natal : Umgeni supra Maritzbourg.
269 ***Polytrichum piliferum** *Schreb.*—In Monte Tabulari.
270 **Polytrichum Rehmanni** *C.M.* n.sp.—Montagu Pass.
270b **Polytrichum Rehmanni** *C.M.* n.sp. *forma.*—In Monte Tabulari.
271
272
273 ***Polytrichum atrichoides** *C.M.* n.sp.—In silvis Knysnae ad Esternek.
[Published by C.M. in Hedwig. xxxviii, 62, as a var. of *P. flexicaule*, which is however only *P. commune. fide* H.N.D.]
274 ***Polytrichum flaccido-gracile** *C.M.* n.sp.—In sylvis Knysnae ad Esternek.
[The same note as on No. 273 applies here.]
275 ***Polytrichum flexicaule** *C.M.* n.sp. fl. ♂.—In silvis Knysnae ad Esternek.
[*P. flexicaule* is quite inseparable from *P. commune* L. *fide* H.N.D.]
275b***Polytrichum flexicaule** *C.M.* n.sp.—Montagu Pass.
276 **Polytrichum commune** var. **africanum** *C.M.*—Montagu Pass.
277 ***Polytrichum trichodes** *Rehm.* n.sp.—Natal : Inczanga.
[*P. commune* L. var. *trichodes* (Rehm.) Dixon in S. Afr. Journ. of Sci. xviii, 323.]
277b***Polytrichum trichodes** *Rehm.* n.sp.—Natal : Inanda.
278 **Octodiceras nigrescens** *Rehm.* n.sp.—Orange Free State : in flumine Caledon ad Kadziberg.
[= *Fissidens julianus* (Sav.) Schimp. See note on No. 581.]
279 **Fissidens Eustichium** *Rehm.* n.sp.—In cavernis Mont. Witteberge supra Kadziberg.
[Mitten reduces this to *Eustichia longirostris* (Brid.) C.M. See note on Rehm. No. 485, infra. If *E. africana* is distinct, as maintained by C. Mueller Rehmann's name must become a synonym of that rather than of *E. longirostris.*]
280 ***Fissidens plumosus** *Hrnsch.*—In silvis Knysnae.
280b***Fissidens plumosus** *Hrnsch.*—Montagu Pass.
281 ***Fissidens fasciculatus** *Hrnsch.*—Devilspeak.
281b***Fissidens fasciculatus** *Hrnsch.* c. fr.—Montagu Pass.
282 ***Fissidens Rehmanni** *C.M.* n.sp.—Montagu Pass.
[= *F. lanceolatus* Bruch *fide* Wilson, Salmon, &c., which again is only *F. glaucescens* Hornsch. The cross refer-

ences in Paris, and in Hedwig. xxxviii, are involved, and the confusion is perhaps best removed by simply stating that *F. Rehmanni* C.M., *F. cymatophyllus* C.M., *F. amblyophyllus* C.M., *F. mucronatus* Schimp., and *F. lanceolatus* Bruch, are all synonyms of the very frequent and variable *F. glaucescens* Hornsch. Cf. No. 592.]

282b***Fissidens Rehmanni** *C.M.* n.sp.—Orange Free State: Kadziberg.

282c***Fissidens Rehmanni** *C.M.* n.sp.—Natal: Van Reenen Pass.

282d***Fissidens Rehmanni** *C.M.* n.sp.—Natal: Inanda.

283 ***Fissidens glaucescens** *Hrnsch.*—Stinkwater.

283b***Fissidens glaucescens** *Hrnsch.*—Devilspeak.

283c***Fissidens glaucescens** *Hrnsch.*—Clermont.
[The actual number on the label is 263c, by an error.]

284 **Fissidens glaucescens** var. **minor** *Rehm.*—Rondebosh.

285 ***Fissidens glaucescens** var. **natalensis** *Rehm.*—Natal: Inanda.
[Published as *F. amblyophyllus* C.M. in Hedwig. xxxviii, 57, but see note on No. 282.]

285b***Fissidens glaucescens** var. **natalensis** *Rehm.*—Natal: Van Reenen Pass.

286 **Fissidens glaucescens** var. **crispus** *C.M.*—Devilspeak: ad catharractam.

287 **Fissidens glaucescens** var. **crispulus** *Rehm.*—Natal: Inczanga.
See No. 592.

288 **Fissidens glaucescens** var. **remotifolius** *Rehm.*—Natal: Van Reenen Pass.

289 ***Fissidens nitens** *Rehm.* n.sp.—Natal: Inanda.

290 ***Fissidens ischyro-bryoides** *C.M.* n.sp.—Devilspeak: ad catharractam.
[= *F. marginatus* Schimp. *fide* H.N.D.]

291 ***Fissidens rufescens** *Hrnsch.*—Cape Town.
[See Rehmann's note on No. 589.]

291b***Fissidens rufescens** *Hrnsch.*—Cape Town.

291c***Fissidens rufescens** *Hrnsch.*—Rondebosh.
[See Rehmann's note on No. 588.]

291d

291e***Fissidens rufescens** *Hrnsch.*—Witteberge supra Kadziberg.

291f ***Fissidens rufescens** *Hrnsch.*—Ad ripam flum. Caledon prope Kadziberg.

292

293 ***Fissidens pycnophyllus** *C.M.* n.sp.—Cape Town.

294 **Fissidens sp.**—In hortis prope Cape Town.
[Cf. No. 585.]

295 **Fissidens sp.**—Devilspeak: in silva.
[*F. splachnifolius* C.M., Rehm. No. 586.]

296 **Fissidens minutulus** *Rehm.* n.sp.—Natal: Inanda.
[The name is however antedated by *F. minutulus* Sull.]

297 ***Rhacopilum capense** *C.M.* n.sp.—Natal : Inanda.
297b***Rhacopilum capense** *C.M.* n.sp.—Natal : Van Reenen Pass.
298 ***Hypopterygium laricinum** *Brid.*—Clermont.
298b***Hypopterygium laricinum** *Brid.*—Montagu Pass.
298c***Hypopterygium laricinum** *Brid.* forma depauperata.—Rondebosh.
299 ***Hypopterygium laricinum** var. **compactum** *C.M.*—Montagu Pass.
300
301 ***Hypopterygium pennaeforme** *Thunb.*—In silvis supra Blanco.
302 ***Wardia hygrometrica** *Harv.*—In rivulis Montis Tabularis.
303
304
305 ***Braunia erosa** *C.M.* n.sp.—Campsbay ad rupes.
306 ***Braunia maritima** *C.M.*—In Monte Tabulari.
307 **Braunia maritima** *C.M.* var. **rufescens** *Rehm.*—In Monte Tabulari.
308 **Braunia flagellaris** *Rehm.* n.sp.—In rupibus Worcester.
309 **Braunia pseudo-diaphana** *Rehm.* n.sp.—Orange Free State : Bethlehem.
310
311 ***Harrisonia Rehmanni** *C.M.* n.sp.—Montagu Pass.
312 ***Harrisonia cuspidata** *Rehm.* n.sp.—In Monte Tabulari.
[Published as *H. gracillima* C.M. in Oesterr. Bot. Zeitschr. xlvii (1897), p. 391. *Rhacocarpus* auctt. plur.]
313 ***Harrisonia cucullata** *Rehm.* n.sp.—In Monte Tabulari.
[Published as *H. Rehmanni* C.M. in Oesterr. Bot. Zeitschr. xlvii (1897), p. 391. *Rhacocarpus* auctt. plur.]
314 ***Harrisonia pilifera** *Rehm.* n.sp.—In Monte Tabulari.
[Published as *H. Eckloniana* C.M. in Oesterr. Bot. Zeitschr. xlvii (1897) p. 398. *Rhacocarpus* auctt. plur.]
314b
315 ***Cryphaea exigua** *C.M.*—In silvis Knysnae ad Portland.
316 ***Leptodon Smithii** *Mohr.* c.fr.—Rondebosh.
316b***Leptodon Smithii** *Mohr.*—Cape Town : ad rupes.
317 ***Lasia producta** *C.M.*—In silvis Knysnae.
318 **Pterogonium gracile** *L.* var. **capense** *Rehm.*—Montagu Pass.
318b **Pterogonium gracile** *L.* var. **capense** *Rehm.*—Stinkwater : ad rupes.
319 ***Leucodon assimilis** *C.M.*—In silvis supra Blanco.
319b***Leucodon assimilis** *C.M.*—Campsbay.
320 **Leucodon assimilis** *C.M.* var. **gracilis** *Rehm.*—In silvis Knysnae.
321 ***Leucodon sericeus** *Hrnsch.*—In silvis Knysnae.
[*Pleuropus*, Broth., Musci, p. 1138.]
321b***Leucodon sericeus** *Hrnsch.*—Clermont.
322 ***Aerobryum capense** *C.M.*—In silvis Knysnae.

322b **Aerobryum capense** *C.M.* var. **rupestre** *Rehm.*—Montagu Pass: ad rupes.

323 **Pilotrichella Rehmanni** *C.M.* n.sp.—Montagu Pass.

324 ***Papillaria africana** *C.M.*—In silvis supra Blanco.

324b **Papillaria africana** var. **rupestris** *Rehm.*—Montagu Pass.

325 **Papillaria africana** var. **Natalensis** *Rehm.*—Natal: Van Reenen Pass.

326 **Papillaria africana** var. **tenuis** *C.M. c.fr.*—In silvis Knysnae.

327 **Neckera capensis** *Br. & Sch.*—Rondebosh.
[=*N. Valentiniana* Besch. *fide* Dixon in Trans. Roy. Soc. S. Afr. viii, 210.]

327b **Neckera capensis** *Br. & Sch.*—In silvis supra Blanco.

328 ***Neckera pseudo-crispa** *Rehm.* n.sp.—Natal: Van Reenen Pass.

329 ***Neckera pterops** *Rehm.* n.sp.—Natal: Van Reenen Pass.
[Published as *Thamnium afrum* C.M. in Hedwig. xxxviii, 129, which is, however, *T. pennaeforme* (C.M.) *fide* Broth., Musci, p. 862.]

330 **Entodon enervis** *Rehm.* n.sp.—Natal: Van Reenen Pass.

331 ***Entodon Natalensis** *Rehm.* n.sp.—Natal: Van Reenen Pass.

332 ***Trachyloma africanum** *Rehm.* n.sp.—In silvis Knysnae.

333 ***Porotrichum pennaeforme** *C.M.*—Clermont.

333b***Porotrichum pennaeforme** *C.M. forma.*—Clermont.

333c***Porotrichum pennaeforme** *C.M. forma.*—In silvis supra Blanco.
[There is reason to believe that this is the plant published as *Porotrichum rostrifolium* C.M. in Hedwig. xxxviii, 128. On one of Sim's labels the name *pennaeforme* was erased; but no other substituted. The particulars given by C.M., loc. cit., agree, but he cites no number.]

334 ***Porotrichum pennaeforme** var. **brachyphyllum** *Rehm.*—Natal: Inanda.
[Published as *P. natalense* C.M. in Hedwig. xxxviii, 129.]

334b***Porotrichum pennaeforme** var. **brachyphyllum** *Rehm.*—Natal: Vildshill.

334c
[See note on No. 434c.]

335 ***Pterygophyllum mniaceum** *C.M.*—In silvis supra Blanco.

336 ***Pterygophyllum sublucens** *C.M.* n.sp.—Montagu Pass.
[=*P. mniaceum* (C.M.) *fide* C.M., Hedwig. xxxviii, 130.]

337 ***Pterygophyllum Rehmanni** *C.M.* n.sp.—Devilspeak: ad catharractam.
[= *P. mniaceum* (C.M.) *fide* C.M. in Hedwig. xxxviii, 130, where No. 338 is apparently a slip for 337.]

338
[We have not seen this No. From C.M. Hedwig. xxxviii, 130, and Rehm. sub Nos. 622 and 622b, it would appear that the labelling read "**Pterygophyllum natalense** *Rehm.* n.sp.—Montagu Pass: loco humido sellam versus."]

339 **Hookeria macropyxis** *Rehm.* n.sp.—Natal: Inanda.
[= *H. Pappeana* Hampe *fide* C.M. in Hedwig. xxxviii, 151. *Hookeriopsis* Jaeg.]

340 **Hookeria subcordata** *Hmpe.*—Devilspeak, ad catharractam.
[= *H. vallis-gratiae* Hampe *fide* C.M. in Hedwig. xxxviii, 152. *Cyclodictyon* Broth., Musci, p. 935.]

341 ***Hookeria Vallis-Gratiae** *Hmpe.*—Devilspeak, ad catharractam.

342 ***Callicostella tristis** *Rehm.* n.sp.—Natal: Inanda.

343 ***Anomodon pseudo-tristis** *C.M.* n.sp.—In silvis Knysnae prope Portland.
[Already published, however, as *Hypnum pseudo-triste* C.M. in Bot. Zeitung, 1855, p. 786. *Haplohymenium* Broth., Musci, p. 986.]

344

345 **Pylaisia africana** *C.M.* n.sp.—Campsbay: ad rupes.
[Probably the plant published as ? *Platygyrium afrum* C.M. in Hedwig. xxxviii, 133.]

346 ***Schwetschkea Rehmanni** *C.M.* n.sp.—In umbrosis prope Blanco.

347 ***Fabronia Rehmanni** *C.M.* n.sp.—Cape Town: ad arborum truncos.

348 **Fabronia densifolia** *Rehm.* n.sp.—In Monte Tabulari, ad rupes.

349 **Fabronia Oraniae** *Rehm.* n.sp.—Orange Free State: Bloemfontein.

350 **Fabronia capensis** *Rehm.* n.sp.—Rondebosh.

351 ***Ischyrodon seriotus** *C.M.*—Cape Town: ad rupes.
[*seriotus* here and in the following two Nos., is a slip for *seriolus*.]

351b***Ischyrodon seriotus** *C.M.* forma **tenella.**—Campsbay.

352 ***Ischyrodon seriotus** *C.M.* var. **albicans** *Rehm.*—Cape Town.

353 **Ischyrodon Rehmanni** *C.M.* n.sp.—Cape Town: ad arborum truncos.
[=*I. seriolus* forma *minor fide* C.M. in Hedwig. xxxviii, 132.]

354 ***Dimerodontium africanum** *C.M.* n.sp.—Clermont ad arborum truncos.

355 ***Pseudoleskea claviramea** *C.M.*—Campsbay, ad rupes.

355b***Pseudoleskea claviramea** *C.M.*—Rondebosh, ad arborum truncos.

355c***Pseudoleskea claviramea** *C.M.*—Orange Free State: Molmonspruit.

355d***Pseudoleskea claviramea** *C.M.*—In Mont. Witteberge supra Kadziberg.

355e***Pseudoleskea claviramea** *C.M.*—Bloemfontein.

355f ***Pseudoleskea claviramea** *C.M.*—Natal: Van Reenen Pass.

356 **Pseudoleskea claviramea** *C.M.* var. **acuminata** *Rehm.*—Cape Town.

357 *__Leskea Breutelii__ *Schmp.*—Cape Town in hortis.
[=*Dimerodontium africanum* C.M. *fide* C.M. in Hedwig. xxxviii, 134.]

358 *__Leskea carnifolia__ *C.M.* n.sp.—Rondebosh: ad arborum truncos.
[Published as *Dimerodontium carnifolium* C.M. in Hedwig. xxxviii, 134.]

359 *__Thuidium versicolor__ *Hrnsch.*—Montagu Pass.

359b*__Thuidium versicolor__ *Hrnsch.*—Portland.

359c*__Thuidium versicolor__ *Hrnsch.*—Natal: Van Reenen Pass.

360 __Thuidium pinnatulum__ *Rehm.* n.sp.—Natal: Van Reenen Pass.
[= *Haplocladium angustifolium* (Hpe. & C.M.) Broth. *fide* C.M. in Hedwig. xxxviii, 149.]

361 __Eurhynchium faucinum__ *C.M.* n.sp.—Campsbay.
[= *Rhynchostegiella Zeyheri* (Spreng.) Broth. *fide* C.M. in Hedwig. xxxviii, 140.]

362 *__Eurhynchium Thuiopsis__ *C.M.* n.sp.—Campsbay.
[= *Rhynchostegium afro-strigosum* C.M. in Hedwig. xxxviii, 140. But this is inseparable from *Rhynchostegiella Zeyheri* (Spreng.) Broth. *fide* H.N.D.]

363 *__Eurhynchium Muelleri__ *Rehm.* n.sp.—Rondebosh.
[The same note applies here as to No. 362.]

364 *__Eurhynchium afro-strigosum__ *C.M.* n.sp.—In umbrosis prope Cape Town.
[Published as *Rhynchostegium.* It is *Rhynchostegiella Zeyheri fide* H.N.D.]

365 __Eurhynchium modestum__ *Rehm.* n.sp.—Stinkwater: ad rupes.

366 __Eurhynchium brevirostre__ *Rehm.* n.sp.—Natal: Inanda.
[= *Microthamnium patens* Hampe *fide* C.M. in Hedwig. xxxviii, 144.]

367 __Eurhynchium Shawii__ *Rehm.* n.sp.—Natal: Inanda.

368 *__Eurhynchium cavifolium__ *Rehm.* n.sp.—Natal: Inanda.
[= *Microthamnium cygnicollum* (Hampe) *fide* C.M. in Hedwig. xxxviii, 144. See however Dixon in Journ. of Bot., 1914, p. 20.]

369 *__Eurhynchium afro-myosuroides__ *C.M.* n.sp.—In umbrosis prope Cape Town.
[Published as *Isothecium afro-myosuroides* C.M. in Hedwig. xxxviii, 147.]

370 *__Rhynchostegium raphidorrhynchum__ *C.M.*—Montagu Pass.

371 __Rhynchostegium julaceum__ *Rehm.* n.sp.—Orange Free State: Kadziberg.

372 *__Rhynchostegium sphaeropyxis__ *Rehm.* n.sp.—Natal: Inczanga.
[Published as *Aptychus sphaeropyxis* (Rehm.) C.M. in Hedwig xxxviii, 141. *Rhaphidostegium* Jaeg.]

373 ***Brachythecium leskeifolium** *C.M.* n.sp.—Towriver.
[This species, (published as *Rhynchostegium leskeifolium* C.M. in Hedwig. xxxviii, 139,) and *Pseudoleskea capillaramea* C.M. op. cit. p. 148, are the same plant !]

374 ***Brachythecium pulchrirete** *C.M.* n.sp.—Towriver.

375 ***Brachythecium rhynchostegioides** *C.M.* n.sp.—In Monte Tabulari.

376 ***Brachythecium membranosum** *C.M.* n.sp.—Towriver.

377 **Brachythecium orthopyxis** *Rehm.* n.sp.—Cape Town.

378 **Brachythecium adscendens** *Hmpe.*—Belveder.
[= *B. implicatum* (Hornsch.) Jaeg. *fide* H.N.D. This reduction is also made by Hampe in herb.]

379 ***Brachythecium afro-velutinum** *C.M.* n.sp.—Rondebosh.
[ = *B. implicatum* (Hornsch.) Jaeg. *fide* H.N.D.]

380 **Brachythecium Macowani** *Rehm.* n.sp.—Orange Free State : Molmonspruit.
[= *B. implicatum* (Hornsch.) Jaeg. *fide* H.N.D.]

381 **Brachythecium Inandae** *Rehm.* n.sp.—Natal : Inanda.

382 ***Brachythecium erythropyxis** *Rehm.* n.sp.—Natal : Inczanga.

382b***Brachythecium erythropyxis** *Rehm.* n.sp.—Natal : Inczanga.

382c***Brachythecium erythropyxis** *Rehm.* n.sp.—Natal : Inczanga.

383 ***Brachythecium Dicksoni** *Rehm.* n.sp.—Natal : Van Reenen Pass.
[= *B. afro-salebrosum fide* C.M. in Hedwig. xxxviii, 136. But cf. note on No. 385.]

383b***Brachythecium Dicksoni** *Rehm.* n.sp.—Orange Free State : Kadziberg.

384

385 ***Brachythecium afro-salebrosum** *C.M.* n.sp.—Rondebosh.
[= *B. implicatum* (Hornsch.) Jaeg. *fide* H.N.D.]

386 **Brachythecium truncorum** *Rehm.* n.sp.—Belveder.

387 ***Brachythecium Knysnae** *C.M.* n.sp.—Ad viam inter Knysna et Belveder.
[= *B. implicatum* (Hornsch.) Jaeg. *fide* H.N.D.]

388 ***Plagiothecium sphagnadelphus** *C.M.*—Houtbay, in rivulo.

389 ***Plagiothecium membranosulum** *C.M.* n.sp.—In Monte Tabulari.

390 ***Plagiothecium selaginelloides** *C.M.* n.sp.—Rondebosh.

391

392 ***Hypnum amplexicaule** *Rehm.* n.sp.—Natal : Van Reenen Pass.
[= *Haplocladium angustifolium* (Hpe. & C.M.) Broth. *fide* H.N.D. Published as *Thuidium amplexicaule* C.M. in Hedwig. xxxviii, 149.]

393 **Hypnum Woodii** *Rehm.* n.sp.—Natal : Inanda.

394 **Hypnum Worthii** *Rehm.* n.sp.—Natal : Inczanga.

395 **Hypnum odontophyllum** *Rehm.* n.sp.—Natal: Van Reenen Pass.

396 ***Hypnum Moorii** *Rehm.* n.sp.—Heksriversberge supra Axellsfarm.
[= *Plagiothecium rhynchostegioides* C.M. *fide* C.M. in Hedwig. xxxviii, 143.]

397 **Hypnum afro-exannulatum** *Rehm.* n.sp.—Natal: Vildshill.

398 ***Hypnum sparsifolium** *Rehm.* n.sp.—Orange Free State: Kadziberg.
[Published as *Drepanocladus sparsus* C.M. in Hedwig. xxxviii, 151.]

399 ***Hypnum fluitans** *Hedw.*—Orange Free State: Kadziberg.
[= *Amblystegium riparium* var. *rivulare fide* Rehm. sub No. 668. Published as *Drepanocladus afro-fluitans* C.M. in Hedwig. xxxviii, 151.]

399b***Hypnum fluitans** *Hedw.* forma.—Orange Free State: Kadziberg.

400 **Hypnum fluitans** *Hedw.* var. **longifolium** *Rehm.*—Orange Free State: Kadziberg.
[The note on No. 399 also applies here.]

401 ***Hypnum Rehmanni** *C.M.* n.sp.—Montagu Pass.
[Published as *Aptychus Rehmanni* C.M. in Hedwig. xxxviii, 142. *Rhaphidostegium* Par.]

402 ***Hypnum Reichardtii** *Rehm.* n.sp.—In Mont. Witteberge supra Kadziberg.
[Published as *Aptychus Reichhardti* (Rehm.) C.M. in Hedwig. xxxviii, 141.]

403 **Hypnum afro-purum** *Rehm.* n.sp.—Orange Free State: Kadziberg.

404 ***Hypnum pendulum** *Rehm.* n.sp.—Devilspeak: ad catharractam.
[Published as *Drepanophyllaria caudicaulis* C.M. in Hedwig. xxxviii, 150.]

405 ***Hypnum mucronatum** *C.M.*—Cape Town.
[*Catagonium*, Broth. Musci, p. 1088.]

405b***Hypnum mucronatum** *C.M.*—In Monte Tabulari.

405c***Hypnum mucronatum** *C.M.*—Montagu Pass.

405d***Hypnum mucronatum** *C.M.*—Natal: Inanda.

406

407

408 ***Hypnum Hyatotis** *C.M.*—In Monte Tabulari.
[Published as *Cupressina hyalotis* C.M. in Hedwig. xxxviii, 147. *Rhaphidostegium* Par.]

409 ***Hypnum Guinzii** *C.M.*—Montagu Pass.
[*Guinzii* is an error for *Gueinzii*. *H. Gueinzii* Hampe, correctly. *Rhaphidostegium* Jaeg.]

409b***Hypnum Guinzii** *C.M.*—In Monte Tabulari.

409c***Hypnum Guinzii** *C.M.*—Stinkwater.

410 ***Hypnum tapeinophyllum** *C.M.* n.sp.—In silvis supra Blanco.
[Published as *Cupressina tapeinophyllum* C.M. in Hedwig. xxxviii, 146. = *Rhaphidostegium krakakammae* (C.M., Jaeg. *fide* H.N.D.]

411 ***Hypnum Dregei** *C.M.*—In silvis Knysnae.
[ = *Rhaphidostegium krakakammae* (C.M.) Jaeg. *fide* H.N.D.]

411b***Hypnum Dregei** *C.M.*—Natal: Inanda.

412 ***Hypnum semirevolutum** *C.M.*—In Monte Tabulari.

413 ***Hypnum anotis** *C.M.* n.sp.—In silvis Knysnae.
[Published as *Cupressina anotis* C.M. in Hedwig. xxxviii, 146. *Rhaphidostegium* Par.]

413b***Hypnum anotis** *C.M.* n.sp. *forma.*—Belveder.

414 ***Hypnum crassicaule** *Rehm.* n.sp.—Natal: Vildshill.
[= Published as *Cupressina crassicaulis* C.M. in Hedwig. xxxviii, 145. = *Rhaphidostegium anotis* (C.M.) *fide* Rehm. sub. No. 678.]

414b***Hypnum crassicaule** *Rehm.* n.sp.—Natal: Inanda.

415 ***Hypnum cupressiforme** *L.*—Cape Town.

415b***Hypnum cupressiforme** *L. forma.*—Cape Town.

415c***Hypnum cupressiforme** *L. forma.*—Cape Town.

416 ***Hypnum dicladum** *C.M.*—Rondebosh.

416b***Hypnum dicladum** *C.M.*—In Monte Tabulari.

417 ***Hypnum cupressiforme** *L.* var. **filiforme.**—Stinkwater.

418 ***Hypnum pseudo-reptans** *C.M.*—In silvis supra Blanco.
[*Microthamnium pseudo-reptans* (C.M.) Jaeg.]

418b***Hypnum pseudo-reptans** *C.M.*—Belveder.

419 ***Rhynchostegium dentigerum** *C.M.* n.sp.—Rondebosh.
[Published as *Cupressina dentigerum* C.M. in Hedwig. xxxviii, 146. *Rhaphidostegium* Par.]

420 ***Rhynchostegium brachycarpum** *Hmpe.*—Rondebosh.
[*Rhaphidostegium brachycarpum* (Hpe.) Jaeg.]

421 ***Rhynchostegium sphaerotheca** *C.M.*—Devilspeak, ad catharractam.
[(and Nos. following, to 423) = *Rhaphidostegium coespitosum* (Sw.) Jaeg. *fide* Dixon in Journ. of Bot. 1920, p. 81.]

421b***Rhynchostegium sphaerotheca** *C.M.*—Devilspeak, ad catharractam.

421c***Rhynchostegium sphaerotheca** *C.M.*—Montagu Pass.

422 **Rhynchostegium sphaerotheca** *C.M.* var. **procerum** *Rehm.*—Natal: Inanda.

423 **Rhynchostegium sphaerotheca** *C.M.* var. **aquaticum** *Rehm.*—Stinkwater.

424

425 ***Archidium Ecklonianum** *Hmpe.*—In aridis apertis vallis Houtbay (prom. B. spei) R.

426 **Archidium chrysosporum** *Schp.* Herb.—In collibus supra Cape Town. R.

427 ***Archidium Rehmanni** *C.M.* n.sp.—In umbrosis montis Devilspeak, supra Cape Town. R.

428

429 ***Archidium falcatulum** *C.M.* n.sp.—In Monte Lionshead supra Cape Town. R.

429b***Archidium falcatulum** *C.M.* n.sp.—In collibus aridis ad Greenspoint. R.

429c***Archidium falcatulum** *C.M.* n.sp.—In umbrosis ad Cape Town. R.

429d***Archidium falcatulum** *C.M.* n.sp.—In umbrosis ad Rondebosh (prom. B. spei) R.

430 **Andraea rupestris** var. **capensis** *Rehm.*—In rup. basalticis montis Rhenosterberg supra Middlebourg elev. 6800: leg. Mac Lea.
[*Andraea* error for *Andreaea*.]

431 ***Sphagnum oligodon** *Rehm.* Exsicc. n. 14.—Transvaalia: in mont. Kwatlamba ad Macmac: leg. Mac Lea.

432 ***Sphagnum coronatum** *C.M.* in Rehm. exsicc. n. 9. In rivulo vallis Brandvley dit.: Worcester. R.

433 ***Sphagnum austro-molle** *C.M.* in Rehm. Exsicc. n. 16, verum. In vertice Montis Tabularis. R.—Obs. Plantae in Exsicc. n. 16c sub hoc nomine editae ad *S. pandurae-folium* C.M. pertinent.
[See note on Nos. 16, 16b, 16c.]

433b***Sphagnum austro-molle** *C.M.* in Rehm. Exsicc. n. 16.—In humidis supra Stinkwater (prom. B. spei). R.

433c***Sphagnum austro-molle** *C.M.* in Rehm. Exsicc. n. 16.—Cape Town. R.

434 ***Sphagnum mollissimum** *C.M.* in Rehm. Exsicc. n. 17.—Transvaalia: in monte Kwatlamba ad Macmac: leg. Mac Lea.

434b***Sphagnum mollissimum** *C.M.* in Rehm. Exsicc. n. 17.—In vertice Montis Tabularis. R.

434c***Sphagnum mollissimum** *C.M.* in Rehm. Exsicc. n. 17.—In vertice Montis Tabularis. R.
[The label has 334c by error.]

435 **Anoectangium mamabolense** *Rehm.* n.sp.—Transvaalia: in mont. Lechlaba supra locum Mamabolo. R.

436 **Gymnostomum obtusatum** *Rehm.* n.sp.—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

437 **Gymnostomum lingulatum** *Rehm.* n.sp.—Transvaalia: in mont. Lechlaba ad Houtbosh. R.

438 ***Weissia viridula** *Hedw.*—Transvaalia: in mont. Kwatlamba supra Lydenburg. leg. Mac Lea.

439 **Trematodon Mac Leai** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

440 **Angstroemia Mac Leana** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

441 **Dicranella graciliramea** *Rehm.* n.sp.—Natal : ad margines fossarum in apertis supra Maritzbourg. R.

442 **Dicranella Mac Leana** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba supra Lydenburg : leg. Mac Lea.

443 ***Leucoloma Rehmanni** *C.M.* in Rehm. Exsicc. n. 29.—Transvaalia : in lignis putridis mont. Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

443b***Leucoloma Rehmanni** *C.M.* in Rehm. Exsicc. n. 29.—Transvaalia : in mont. Lechlaba supra Houtbosh. R.

444 **Leucoloma Woodii** *Rehm.* et *MacOwan* n.sp. c.fr !—Transvaalia : ad truncos arborum vetustorum in mont. Lechlaba. R.
[= *L. chrysobasilare* (C.M.) Jaeg. *fide* Dixon in S. Afr. Journ. of Sci. xviii, 302.]

445 **Campylopus flavescens** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Macmac : leg. Mac Lea.

446 ***Campylopus chlorophyllosus** *C.M.*—Transvaalia : in uliginosis mont. Lechlaba ad Houtbosh. R.

446b***Campylopus chlorophyllosus** *C.M.*—Transvaalia : in uliginosis mont. Lechlaba ad Houtbosh. R.

447 **Campylopus Mac Leanus** *Rehm.* n.sp.—Transvaalia : in silvis mont. Kwatlamba supra Pilgrimsrest ad rupes; 1874 : leg. Mac Lea.

448 **Campylopus latifolius** *Rehm.* n.sp.—Transvaalia : in uliginosis mont. Lechlaba ad Houtbosh. R.

449 **Campylopus chlorotrichus** *C.M.* in Rehm. Exsicc. n. 53, forma **orthophylla.**—Natal : in umbrosis montis Inanda : leg. J. Wood.

450 **Campylopus Transvaaliensis** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Macmac : leg. Mac Lea.

451 **Campylopus clavatus** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Macmac : leg. Mac Lea.
[Name antedated by *C. clavatus* (R. Br.) H.f. & W., and altered to *C. pseudo-clavatus* by Paris, but both names remain *nomina nuda.*]

452.

453 ***Octoblepharum albidum** *Hedw.*—Transvaalia : in sylvaticis mont. Kwatlamba ad Macmac; leg. Mac Lea.

453b***Octoblepharum albidum** *Hedw.*—Natal : in montosis Graet Noodsberg ad arb. truncos : leg. J. Wood.

454 ***Leucobryum Guinzii** *C.M.*—Transvaalia : in mont. Kwatlamba ad Pilgrimsrest : leg. Mac Lea.
[*Guinzii* should read *Gueinzii.*]

454b*Leucobryum Guinzii *C.M.*—Transvaalia : in mont. Lechlaba supra Houtbosh. R.

455 **Leucobryum Mac Leanum** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba supra Macmac ad rupes : leg. Mac Lea.

456 **Schistomitrium africanum** *Rehm.* n.sp.—Transvaalia : in solo muscoso mont. Kwatlamba ad Macmac, altit. c. 8000 ped. s.m. : leg. Mac Lea.
[= *L. madagassum* Besch. *fide* Cardot, Recherches sur les Leucobryacées, p. 26, and Mousses de Madagascar, p. 142.]

457 **Phascum assimile** *C.M.*—In collibus apertis supra Cape Town. R.

458 **Hyophila Basutensis** *Rehm.* Exsicc. n. 100 (sub Barbula).—Terra Capensis orientalis in monte Rhenosterberg in Majo 1873 leg. Mac Lea.

459 **Hyophila Basutensis** *Rehm.* Exsicc. n. 100 (sub Barbula) var. **tenella.**—Terra Capensis orientalis, loc. non design. : leg. Mac Lea.

460 **Pottia verrucosa** *Rehm.* n.sp.—Terra Capensis orientalis : ad Graaf Reynett (?) leg. Mac Lea.

461 **Pottia Mac Leana** *Rehm.* n.sp.—Terra Capensis orientalis : in apertis circa Graaf Reynett : leg. Mac Lea.

462 ***Pleuridium nervosum** *Hook.*—In elatis supra Graaf Reynett : leg. Mac Lea.

462b***Pleuridium nervosum** *Hook.*—In Monte Leonis supra Cape Town. R.

463 ***Bruchia Rehmanni** *C.M.* n.sp.—In umbrosis supra Rondebosh (prom. B. spei) ad terram humidam. R.

464 ***Leptotrichum capense** *C.M.*—Transvaalia : in monte Kwatlamba supra Pilgrimsrest : leg. Mac Lea.
[See note on No. 84.]

464b***Leptotrichum capense** *C.M.*—Natal : in umbrosis montis Inanda. J. Wood.

465 **Leptotrichum Mac Leanum** *Rehm.* n.sp.—Transvaalia : in Mont. Kwatlamba supra Pilgrimsrest : leg. Mac Lea.

466 **Leptodontium armatum** *Rehm.* n.sp.—Transvaalia : ad rupes umbrosis in mont. Kwatlamba circa Macmac : leg. Mac Lea.
[= *L. squarrosum* (Hook.) var. *paludosum* (Ren. & Card.) Card. *fide* H.N.D.]

466b **Leptodontium armatum** *Rehm.* n.sp.—Transvaalia : in silvis montium Lechlaba supra Houtbosh. R.

467 **Leptodontium armatum** *Rehm.* n.sp. var. **brevifolium.**—Transvaalia : in mont. Lechlaba supra Houtbosh. R.
[= *L. squarrosum* (Hook.) Par. *fide* H.N.D.]

468 **Trichostomum dentatum** *Rehm.* n.sp.—Transvaalia : in mont. Lechlaba circa Houtbosh, ad rivulos. R.

468b **Trichostomum dentatum** *Rehm.* n.sp.—Transvaalia : loc. non design. leg. Mac Lea.

469 **Trichostomum Bainsii** *Rehm.* Exsicc. n. 118.—Transvaalia : in silvis montium Kwatlamba supra Pilgrimsrest : leg. Mac Lea.

469b **Trichostomum Bainsii** *Rehm.* Exsicc. n. 118.—Natal : ad rupes umbrosas montis Inczanga. R.

470 **Trichostomum Mahaliesmontanum** *Rehm.* n.sp.—Transvaalia : ad ripas fluminis Aapiesriver in mont. Mahaliesberge (Pretoria) leg. Mac Lea.

471 **Trichostomum sulphureum** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba supra Pilgrimsrest : leg. Mac Lea.

472 **Trichostomum erosum** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Müllersfarm : leg. Mac Lea.

473 ***Trichostomum afro-phaeum** *Rehm.* Exsicc. n. 120.—Transvaalia : loc. non design. leg. Mac Lea.
[See note on No. 120.]

474 **Trichostomum oocarpum** *Rehm.* Exsicc. n. 117.—Transvaalia : in mont. Kwatlamba supra Pilgrimsrest : leg. Mac Lea.

474b **Trichostomum oocarpum** *Rehm.* Exsicc. n. 117, var. **lanceolatum.**—Transvaalia : in mont. Kwatlamba ad Müllersfarm : leg. Mac Lea.

475 ***Trichostomum atro-virens** *Rehm.* Exsicc. n. 119.—Transvaalia : loc. non design. : leg. Mac Lea.

476 **Barbula syrrhopodontoides** *Rehm.* n.sp.—Transvaalia : in montibus Lechlaba supra Houtbosh, ad truncos acaciarum. R.

477 ***Barbula ruralis** *Hedw.*—Terra Capensis orientalis : in monte "Cave Mountain" supra Graaf Reynett : leg. Mac Lea.

478 ***Barbula pilifera** *Hook.*—Terra Capensis orientalis : in montibus graminosis supra Graaf Reynett (occid. versus) Aprili 1872. leg. Mac Lea.
[See note on No. 110.]

479 **Barbula caespitosa** var. **angustifolia.**—Terra Capensis orientalis loc. non design. leg. Mac Lea.
[*Tortella*, Limpr. The S. African plant is not separable from the northern and S. American *T. caespitosa* (Schwaegr.), *fide* H.N.D.]

480 ***Barbula recurvata** *Hook.*—Terra Capensis orientalis : in montibus supra Graaf Reynett : leg. Mac Lea.
[See note on No. 89.]

481 **Barbula recurvata** var. **aristatula** *C.M.*—Transvaalia : in mont. Kwatlamba ad Müllersfarm : leg Mac Lea.

482 **Barbula Mac Leana** *Rehm.* n.sp.—Terra Capensis orientalis : in rupestribus montis Rhenosterberg c. 6500 ped. s. m. : leg. Mac Lea (1873).

483 ***Barbula trichostomacea** *C.M.* in Rehm. Exsicc. n. 97.—Promontorium Bonae Spei : in collibus supra Capetown. R.

484 **Barbula** (?) **sp.**—In promontorio Bonae Spei in muris vetustis circa urbem.
[The Kew label is written up by Brotherus as "*subxanthocarpa* Broth. n.sp."]

485 ***Eustichia longirostris** *Brid.* (teste Mitten). *Fissidens Eustichium* Rehm. Exsicc. n. 279.—Orange Free State: in cavernis montium Witteberge supra Kadziberg, ad rupes. m. Aprili 1876. R.
[See note on No. 279.]

486 ***Syrrhopodon uncinifolius** *C.M.* in Rehm. Exsicc. n. 129.—Transvaalia: in umbrosis mont. Kwatlamba supra Lydenburg: leg. Mac Lea.

486b***Syrrhopodon uncinifolius** *C.M.* in Rehm. Exsicc. n. 129.—Natal: in umbrosis montis Inanda: leg. J. Wood.

487 ***Syrrhopodon Dregei** *Hrnsch.* c. fr.—Terra Capensis orientalis: ad truncos Encephalarti in summo monte Windvogelberg, prope Siloh, dit. Queenstown.

487b***Syrrhopodon Dregei** *Hrnsch.*—Transvaalia: in mont. Lechlaba ad Houtbosh, ad arb. truncos. R.

488 **Syrrhopodon pyriformis** *C.M.*—Transvaalia: in silvis mont. Lechlaba supra Houtbosh. R.
[= *S. pomiformis* (Hook.) *fide* Par. Ind. Ed. 2.]

489 ***Encalypta ciliata** *Hedw.*—Terra Capensis orientalis: in monte Rhenosterberg, elev. 6800 p. s.m. m. Majo 1873: leg. Mac Lea.

490 ***Encalypta vulgaris** *Hedw.*—Terra Capensis orientalis: in monte Rhenosterberg: leg. Mac Lea.

491 ***Grimmia Eckloni** *C.M.*—Terra Capensis orientalis: Graaf Reynett: leg. Mac Lea.
[Should read *G. Eckloni* Spreng. See note on No. 133.]

492 ***Grimmia campestris** *Burch.*—Terra Capensis orientalis, loco non design.: leg. Mac Lea.

493 **Grimmia Mac Leana** *Rehm.* n.sp.—Terra Capensis orientalis: "Valley of Desolation" leg. Mac Lea.

494 ***Grimmia apocarpa** *Hedw.*—Transvaalia: in mont. Mahaliesberge ad rupes: leg. Mac Lea.

494b***Grimmia apocarpa** *L.*—Terra Capensis orientalis: ad rupes montis Oudelberg: leg. Mac Lea.

494c***Grimmia apocarpa** *L.*—Natal: in montibus Kwatlamba ad Van Reenen's Pass. R.

495 ***Ptychomitrium crispatum** *Hrnsch.*—Terra Capensis orientalis: Graaf Reynett: leg. Mac Lea.

496 ***Ptychomitrium cucullatifolium** *C.M.*—Terra Capensis orientalis: Graaf Reynett: leg. Mac Lea.

497 **Zygodon affinis** *Rehm.* n.sp.—Transvaalia: in mont. Kwatlamba ad Macmac: leg. Mac Lea.

498 ***Zygodon Rehmanni** *C.M.* in Rehm. Exsicc. n. 149.—In mont. Outanikwa, ad arborum truncos. R.
[*Z. Rehmanni* is reduced to *Z. trichomitrius* H. f. & W. by C.M. in Hedwig. xxxviii, 115.]

499 ***Zygodon leptobolax** *C.M.* in Rehm. Exsicc. n. 147.—In prom. Bonae Spei ad saxa umbrosa supra Rondebosh.

500 **Zygodon Transvaaliensis** *Rehm.* n.sp.—Transvaalia: in mont. Lechlaba ad arborum truncos. R.
[= *Hypnodon transvaaliensis* C.M. in Hedwig. xxxviii, 126, *fide* Paris—but on whose authority ?]

501 **Zygodon Mac Leanus** *Rehm.* n.sp.—Transvaalia: in mont. Kwatlamba, supra Pilgrimsrest: leg. Mac Lea.

502 ***Schlotheimia Grevilleana** *Mitt.*—Natal: in umbrosis montis Inanda: leg. J. Wood.

502b***Schlotheimia Grevilleana** *Mitt.*—Transvaalia: in mont. Kwatlamba ad Pilgrimsrest: leg. Mac Lea.

502c***Schlotheimia Grevilleana** *Mitt.*—Transvaalia: in mont. Kwatlamba supra Macmac.

503 **Schlotheimia Mac Leai** *Rehm.* n.sp.—Transvaalia: in montibus Kwatlamba ad Macmac: leg. Mac Lea.

504 ***Schlotheimia cuspidata** *C.M.* in Rehm. Exsicc. n. 155.—Colonia Capensis: in silvis Knysnae. R.
[See note on No. 155.]

504b***Schlotheimia cuspidata** *C.M.* in Rehm. Exsicc. n. 155.—Transvaalia: Houtbosh. R.

505 ***Schlotheimia cuspidata** *C.M.* in Rehm. Exsicc. n. 155 var. **tenuis.**—Montagu Pass. R.

506 **Schlotheimia mollis** *Rehm.* n.sp.—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

507 **Schlotheimia mollis** *Rehm.* n.sp. forma *procera.*—Transvaalia: in montibus Lechlaba ad Houtbosh. R.

508 **Dasymitrium Mac Leai** *Rehm.* n.sp.—Transvaalia: in montibus Kwatlamba ad Macmac: leg. Mac Lea.

508b **Dasymitrium Mac Leai** *Rehm.* n.sp.—Transvaalia: in montibus Lechlaba supra Houtbosh, ad arborum truncos. R.

509 ***Macromitrium Dregei** *Hrnsch.*—Transvaalia: in montibus Kwatlamba ad Pilgrimsrest: leg. Mac Lea.

510 ***Macromitrium microphyllum** *Brid.*—Transvaalia: in montibus Kwatlamba ad Macmac: leg. Mac Lea.

510b***Macromitrium microphyllum** *Brid.*—Colonia Capensis orientalis: Valley of Desolation leg. Mac Lea.

511 ***Macromitrium tenue** *Brid.*—Transvaalia: in montibus Kwatlamba ad Macmac: leg. Mac Lea.

511b***Macromitrium tenue** *Brid.*—Transvaalia: ad montibus Kwatlamba ad Macmac; leg. Mac Lea.

511c***Macromitrium tenue** *Brid.*—Terra Capensis orientalis: Valley of Desolation: leg. Mac Lea.

512 **Macromitrium tenue** *Brid.* var. **brevirameum.**—Transvaalia: in umbrosis ad Houtbosh. R.

513 ***Macromitrium lycopodioides** *Schwgr.*—Transvaalia: in mont. Kwatlamba circa Macmac: leg. Mac Lea.

513b***Macromitrium lycopodioides** *Schwgr.*—Terra Capensis orientalis: Valley of Desolation leg. Mac. Lea.

514 **Orthotrichum Mac Leai** *Rehm.* n.sp.—Terra Capensis orientalis, loco non designato : leg. Mac Lea.

515 ***Orthotrichum pseudo-tenellum** *Hmpe.* (?).—Terra Capensis orientalis : loco non design. : leg. Mac Lea.

516 **Orthotrichum piliferum** *Schmp.* in herb.—Terra Capensis orientalis loco non design. : leg. Mac Lea.

517 **Orthotrichum transvaaliense** *Rehm.* n.sp.—Transvaalia : in mont. Lechlaba circa Houtbosh ad truncos Faureae. R.

518 ***Rehmanniella africana** *C.M.* Bot. Centralblatt Vol. vii, no. 37. = *Sphaerangium africanum* Rehm. Exsicc. n. 171. —Orange Free State : Bloemfontein. R.
[See note on No. 171.]

519 **Physcomitrium Mac Leai** *Rehm.* n.sp.—Terra Capensis orientalis : ad ripas flum. Sunday River, prope Graaf Reynett : leg. Mac Lea.

520 **Physcomitrium Mac Leai** *Rehm.* n.sp. forma *humilis*.—Terra Capensis orientalis : in solo argilloso juxta fontem prope Graaf Reynett : leg. Mac Lea.

521 ***Entosthodon marginatus** *C.M. E. ampliretis* Rehm. Exsicc. n. 174.—Natal : ad rivulos supra Pietermaritzburg. R.

521b ***Entosthodon marginatus** *C.M. E. ampliretis* Rehm. Exsicc. n. 174.—Transvaalia : in montibus Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

522 **Entosthodon chlorophyllosus** *Rehm.* Exsicc. n. 177.—In montibus Drakensteinberge ad Bainskloof : leg. Mac Lea.

522b **Entosthodon chlorophyllosus** *Rehm.* Exsicc. n. 177.—Transvaalia : in montibus Magaliesberge (?) : leg. Mac Lea.

523 **Entosthodon rhomboideus** *Shaw* (Cape Monthly Magazine 1878. p. 315 sub *Funaria*).—Terra Capensis orientalis : Graaf Reynett ad margines fossarum : leg. Mac Lea.

523b **Entosthodon rhomboideus** *Shaw* (Cape Monthly Magazine 1878, p. 315 sub *Funaria*).—Terra Capensis orientalis : Graaf Reynett ad ripas flum. Sunday River : leg. Mac Lea.

524 **Funaria serrata** *Rehm.* n.sp.—In hortis circa Cape Town. R.
[Name however pre-occupied by *F. serrata* P. Beauv.]

525 ***Funaria lonchopelma** *C.M.* in Rehm. Exsicc. n. 181.—Transvaalia : loco non design. : leg. Mac Lea.

526 ***Funaria hygrometrica** *L.* typus.—Transvaalia : in ruderatis ad Macmac : leg. Mac Lea.

526b ***Funaria hygrometrica** *L.* typus.—Terra Capensis orientalis : ad ripas flum. Sunday River, prope Graaf Reynett leg. Mac Lea.

527 ***Funaria hygrometrica** *L.* forma *latifolia*.—Terra Capensis orientalis : ad ripas flum. Sunday River, prope Graaf Reynett : leg. Mac Lea.

528 **Funaria hygrometrica** *L.* var. **planifolia.**—Natal : in montibus Kwatlamba ad Ladysmith. R.

529 **Glyphocarpus pilulifer** *C.M.* in Rehm. Exsicc. n. 187.—Oudeberg Mt. prope Graaf Reynett, juxta fontem, 3800 p. s.m., Majo 1872 : leg. Mac Lea.
[C.M. in Hedwig. xxxviii, 90, refers *G. pilulifer* to *Bartramidula comosa* (Hpe. & C.M.) Broth.]

530 **Glyphocarpus humilis** *Rehm.* n.sp.—Terra Capensis orientalis : loc. non design. : leg. Mac Lea.
[Name altered to *G. Mac-Leanus* by Paris, on account of *G. humilis* (Mitt.) Jaeg.]

531

532 ***Bartramia afro-uncinata** *C.M.* in Musc. MacOwanianis N. 10.—Terra Capensis orientalis : ad clivos glareosos medii montis Boshberg, prope Somerset-East, 1878 leg. Mac Owan.
[*Philonotis* Par. Ind. C. M. describes it as dioicous. It is however autoicous, and is quite inseparable from *P. androgyna* (Hampe) Jaeg., *fide* H.N.D.]

533 **Bartramia marginalis** *Rehm.* Exsicc., n. 202.—Natal : in mont. Kwatlamba ditionis Ladysmith. R.

534 **Bartramia vaginans** *Rehm.* Exsicc. n. 201.—Terra Capensis orientalis in monte Rhenosterberg : leg. Mac Lea.

535 ***Philonotis oranica** *Rehm.* Exsicc. n. 192.—Transvaal : in mont. Mahaliesberge (?) : leg. Mac Lea.
[See note on No. 192.]

536 ***Philonotis oranica** *Rehm.* Exsicc. n. 192. forma *atro-virens*.—Transvaal : in mont. Lechlaba supra Houtbosh ad rivulos. R. [See note on No. 192.]

537 **Philonotis Woodii** *Rehm.* n.sp.—Natal : in monte Inanda : leg. J. Wood.

538 **Breutelia angustifolia** *Rehm.* n.sp.—Transvaalia in umbrosis mont. Kwatlamba ad Macmac (?) : leg. Mac Lea.

539 **Breutelia Mac Leana** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba prope Macmac ad ripas fluminis Sabie : leg. Mac Lea.

540 ***Anomobryum procerrimum** *Rehm.* Exsicc. n. 214 (sub *Mielichoferia*).—Transvaalia : in montibus Kwatlamba ad ripas fluminis Sabie : leg. Mac Lea.
[See note on No. 214.]

541 **Mielichoferia elongata** *Rehm.* Exsicc. n. 212.—Transvaalia : locis non designatis : leg. Mac Lea.
[See note on No. 212.]

542 **Mielichoferia Vallis gratiae** *Hmpe.*—Prom. B. Spei : in dumetis supra Newlands, ad radices arborum. R. Obs. Specimina hujus plantae sub N. 224 pro *Webera brachymeniacea* C.M. (conf. N. 553) cum qua eodem loco occupat, ex parte edita.
[ined. Jaeger Adumbr. makes this a synonym of *M. Ecklonii* Hornsch., without giving any authority.]

543 *__Leptochlaena Rehmanni__ *C.M.* in Rehm. Exsicc. n. 215.—Transvaalia: in montibus Kwatlamba ad Macmac: leg. Mac Lea.

543b*__Leptochlaena Rehmanni__ *C.M.* in Rehm. Exsicc. n. 215.—Terra Capensis orientalis: Valley of Desolation supra Graaf Reynett: leg. Mac Lea.

544 *__Brachymenium pulchrum__ *Hook.*—Transvaal: in sylvis primaevis mont. Kwatlamba ad Macmac: leg. Mac Lea.

544b*__Brachymecium pulchrum__ *Hook.*—Natal: in dumetis supra Maritzbourg. R.

544c*__Brachymenium pulchrum__ *Hook.*—Natal: Karkloof ad arborum truncos. R.

545 __Brachymenium eriophorum__ *Rehm.* n.sp.—Transvaalia locis non designatis: leg. Mac Lea.

546 *__Brachymenium Koratranum__ *C.M.*—Transvaalia: in silvis primaevis montium Lechlaba supra Houtbosh. R.
[See note on No. 218.]

547 __Webera Woodii__ *Rehm.* n.sp.—Natal: in clivosis montis Inanda: leg. J. Wood.

547b __Webera Woodii__ *Rehm.* n.sp.—Transvaalia: in umbrosis montium Kwatlamba ad Pilgrimsrest: leg. MacLea.

548 __Webera Mac Leai__ *Rehm.* n.sp.—Terra Capensis orientalis: in monte Rhenosterberg: leg. Mac Lea.

549 __Webera gregaria__ *Rehm.* n.sp.—Transvaalia: in mont. Kwatlamba, ad Pilgrimsrest: leg. Mac Lea.

550 *__Webera leptoblepharon__ *C.M.*?—Transvaalia: in dumetis montium Kwatlamba ad Macmac: leg. Mac Lea.

551 *__Webera austro-nutans__ *C.M.* in Rehm. Exsicc. n. 221.—Transvaalia: in montibus Kwatlamba ad Pilgrimsrest: leg. Mac Lea.
[See note on No. 221.]

552 __Webera Montis Cavi__ *Rehm.* n.sp.—Colonia Capensis orient. in "Cave Mountain" supra Graaf Reynett; leg. Mac Lea.

553 __Webera brachymeniacea__ *C.M.* in Rehm. Exsicc. n. 224 vera (conf. No. 542) Prom. Bon. Spei: in fruticetis circa Newlands, ad arborum radices. R.

554 *__Bryum leucotrix__ *C.M.* in Musc. Mac Owanianis nr. 20, *Br. integrifolium* Rehm. exsicc. nr. 226. c.fr!—Natal: in umbrosis montis Madziuba (Kwatlamba). R.
[See note on No. 226. Par. Ind. Ed. 2 sub *Rhodobryum* has confused this; *R. leptothrix* should be deleted—no such name was used by C.M.—and the synonymy placed under *R. leucothrix*, the references to *Br. leptothrix* belonging to *Bryum leucothrix*. N.B. "montis Madziuba," better known as Majuba Hill.]

554b*__Bryum leucotrix__ *C.M.* in Musc. Mac Owanianis nr. 20, *Br. integrifolium* Rehm. Exsicc. nr. 226, forma *prolifera*.—Transvaalia: in montibus Kwatlamba ad Pilgrimsrest: leg. Mac Lea.

555 **Bryum argutidens** *Rehm.* (Exsicc. nr. 330, forma *prolifera*) *typus* !—Transvaalia : in silvis montium Lechlaba ad Houtbosh. R.
[The No. 330 in this and in the two following ones should be 230.]

555b **Bryum argutidens** *Rehm.* (Exsicc. nr. 330, forma *prolifera*) *typus !*—Transvaalia : in sylvis montium Kwatlamba ad Pilgrimsrest : leg. Mac Lea.
[= *Rhodobryum laxiroseum* (C.M.) *fide* Thériot in litt. ad H.N.D.]

556 **Bryum argutidens** *Rehm.* Exsicc. nr. 330 forma *prolifera.*—Transvaalia : in umbrosis mont. Lechlaba ad Houtbosh. R.
[= *Rhodobryum spinidens* (Ren. & Card.) *fide* Thériot in litt. ad H.N.D.]

557 **Bryum syntrichioides** *C.M.* in Rehm. Exsicc. n. 228.—Transvaalia : in montibus Kwatlamba ad Pilgrimsrest : leg. Mac Lea.
[See note on No. 228. Brotherus has expressed the opinion that 557, 557b, 557c scarcely differ from *B. erythrocaulon* Schwaegr. It appears to me that all are inseparable from the highly variable and almost cosmopolitan (south sub-tropical) *B. truncorum* Brid. The only differences of any value attributed to the two forms are the rosulate leaves in *B. truncorum*, and the more equal foliation in *B. erythrocaulon*. But both forms of foliation are represented in these numbers of Rehmann's. Moreover *B. erythrocaulon* is stated by Cardot (Mousses de Madagascar) to be scarcely different from *B. ramosum* (Hook.), and this was referred by Mitten to *B. truncorum.* H.N.D.]

557b **Bryum syntrichioides** *C.M.* in Rehm. Exsicc. n. 228, forma *umbrosa.*—Transvaalia : in mont. Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

557c **Bryum syntrichioides** *C.M.* in Rehm. Exsicc. n. 228, forma *procerior.*—Transvaalia : in umbrosis ad Houtbosh. R.

558 **Bryum sp. No. 1a.**—Transvaalia : in montibus Kwatlamba ad Macmac : leg. Mac Lea.

558b **Bryum sp. No. 1b.**—Transvaalia : in mont. Lechlaba ad Houtbosh. R.

559 **Bryum sp. No. 2.**—Transvaalia : in solo silvestri ad Houtbosh. R.

560 ***Bryum torquescens** *Br. & Sch.*—Transvaalia : in truncis Acaciarum circa Houtbosh. R.

561 **Bryum sp. No. 3.**—In solo arenoso : Prom. Bonae Spei ad Stinkwater. R.
[The Kew specimen is written up by Brotherus "*torquescens* Bry. eur."]

562 **Bryum sp. No. 4.**—Transvaalia : loco non designato : leg. Mac Lea.

563 **Bryum sp. No. 5.**—Transvaalia : in mont. Kwatlamba ad Müllersfarm : leg. Mac Lea.

564 **Bryum sp. No. 6.**—Colonia Capensis orientalis : ad ripas flum. Sundayriver, prope Graaf Reynett : leg. Mac Lea.

565 **Bryum sp. No. 7.**—Transvaalia : in mont. Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

566 **Bryum sp. No. 8.**—Transvaalia : in montibus Lechlaba ad Houtbosh. R.

567 **Bryum sp. No. 9.**—Colonia Capensis orientalis : loco non design. : leg. Mac Lea.

568 **Bryum sp. No. 10.**—Transvaalia : in montibus Lechlaba ad Houtbosh. R.
[The Kew specimen is written up by Brotherus "*lechlabense* n.sp."]

569 **Bryum sp. No. 11.**—Transvaalia : in montibus Kwatlamba ad Müllersfarm : leg. Mac Lea.

570 **Mnium sp.**—Transvaal : in umbrosis montium Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

571 ***Atrichum androgynum** *C.M.*—Transvaalia : in montibus Kwatlamba supra Pilgrimsrest : leg. Mac Lea.

572 **Atrichum polyphyllum** *Rehm.* Exsicc. n. 266.—Transvaalia : ad rivulorum ripas in mont. Mahaliesberge (?) : leg. Mac Lea.
[See note on No. 266.]

573 ***Pogonatum capense** *Hmpe.*—Transvaalia : in mont. Mahaliesberge ad ripas fluviorum : leg. Mac Lea.

574 **Pogonatum sp.** (non exam.)—Natal : Kwatlamba in umbrosis ad Van Reenen's Pass. R.

575 **Polytrichum yuccoides** *Rehm.* n.sp.—Transvaal : in mont. Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

576 **Polytrichum Rehmanni** *C.M.* in Rehm. Exsicc. n. 270 var. **julaceum.**—Transvaal : in mont. Lechlaba supra Houtbosh. R.

576b **Polytrichum Rehmanni** *C.M.* in Rehm. Exsicc. n. 270 var. **julaceum.**—Transvaal : in region. alpestr. mont. Kwatlamba ad Macmac : leg. Mac Lea.

577 ***Polytrichum commune** *H.* var. **Mac Leanum.**—Transvaal : in mont. Kwatlamba supra Macmac : leg. Mac Lea.

578 ***Polytrichum trichodes** *Rehm.* Exsicc. n. 277.—Transvaal : in monte Kwatlamba supra Pilgrimsrest : leg. Mac Lea.
[See note on No. 277.]

579 **Polytrichum sp.** (non exam.).—Natal : Kwatlamba, in umbrosis ad Van Reenen's Pass.

580 **Polytrichum Buchanani** *Rehm.* n.sp.—Natal : in statione Umpumulo : leg. Revd. Buchanan.

581 ***Octodiceras capensis** *C.M.* typus.—Transvaalia : in montibus Kwatlamba ad Macmac : leg. Mac Lea.
[= *Fissidens julianus* (Sav.) Schimp. *fide* Dixon in Trans. Roy. Soc. S. Afr. viii, 188.]

581b*Octodiceras capensis *C.M.* typus.—Terra Capensis orientalis : in scaturiginibus montis Nadouwsberg : leg. Mac Lea.

582 Octodiceras capensis *C.M.* var. nigrescens *Rehm.* Exsicc. No. 278.—Transvaalia : in montibus Kwatlamba ad Macmac : leg. Mac Lea.
[See note on No. 581.]

582b Octodiceras capensis *C.M.* var. nigrescens *Rehm.* Exsicc. n. 278.—Natal : in rivulis mont. Kwatlamba ad Van Reenen's Pass. R.

583 Fissidens Mac Leanus *Shaw* in Cape Monthly Magazine 1878, p. 314.—Terra Capensis orientalis : in solo humoso inter lapides in montibus pagum Graaf Reynett ab occidente cingentibus, elev. 3000 p. leg. Mac Lea.

584 *Fissidens pycnophyllus *C.M.* in Rehm. Exsicc. n. 293.—Transvaalia : loco non designato : leg. Mac Lea.

585 Fissidens stolonifer *Rehm.* n.sp. = *Fissidens* sp. No. 294.—Prom. Bonae Spei in hortis circa Cape Town, vulgaris. R.

586 *Fissidens splachnifolius *C.M.* = *Fissidens* No. 295.—Prom. Bonae Spei : in solo campestri circa Cape Town. Rehm.

587 *Fissidens rufescens *Hrnsch.*—Terra Capensis orientalis : in monte Boshberg : leg. Mac Owan (nr. 64).

588 Fissidens rufescens *Hrnsch.* var. orthopyxis.—Terra Capensis orientalis : in solo humido ad fontem montis Overkant, prope Graaf Reynett : Mac Lea legit. Obs. *F. rufescens* sub nr. 291*c*, *f*, editus ab hoc non diverens.
[*diverens* is obviously a slip for *divergens* or *diversus*.]

589 Fissidens pseudo-rufescens *Rehm.* n.sp.—Orange Free State, in monte Kadziberg, supra Caledon River. Obs. Eadem stirps sub 291 forma cum *F. rufescente* Hrnsch. confusa.
[Whatever this may be worth the name is ante-dated by *F. pseudo-rufescens* C.M., and is altered to *F. austro-africanus* by Paris.]

590 *Fissidens remotifolius *C.M.*—Transvaalia : in montibus Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

591 *Fissidens remotifolius *C.M.* status praematurus.—Transvaalia : in montibus Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

592 Fissidens lanceolatus *Hmpe.* = *F. cymatophyllus* C.M. in Musc. MacOwanianis No. 46.—Transvaalia : in montibus Kwatlamba ad Pilgrimsrest : leg. Mac Lea. Obs. Huc quoque pertinent specimina sub n. 282b, c, d, pro *F. Rehmanni* C.M. et sub n. 287 pro *F. glauco* var. *crispula* edita.
[See note on No. 282.]

593 *Fissidens natalensis *Rehm.*—*F. glaucescens* var. *natalensis* Rehm. Exsicc. n. 285.—Transvaalia : in montibus Kwatlamba ad Macmac : leg. Mac Lea.
[Not specifically separable from *F. glaucescens*, *fide* H.N.D.]

593b*__Fissidens natalensis__ *Rehm.* = *F. glaucescens* var. *natalensis* Rehm. Exsicc. n. 285.—Transvaalia: in umbrosis montium Lechlaba ad Houtbosh. R.

593c*__Fissidens natalensis__ *Rehm.* forma. = *F. glaucescens* var. *natalensis* Rehm. Exsicc. n. 285.—Transvaalia: in montibus Kwatlamba ad Müllersfarm. R.

594 *__Rhacopilum capense__ *C.M.*—Transvaalia: in monte supra Lydenburg: leg. Mac Lea.

594b*__Rhacopilum capense__ *C.M.*—Transvaalia: in monte supra Houtbosh. R.

594c*__Rhacopilum capense__ *C.M.*—Transvaalia: in montibus Mahaliesberg: leg. Mac Lea.

595 __Chalubinskia africana__ *Rehm.* n. gen. et sp.—Transvaalia: in silvis primaevis mont. Lechlaba in latere meridionali summi montis Snellskop, ad arborum truncos. R.
[This has been long recognised as a Hepatic—*Herberta juniperina.*]

596 *__Hedwigia Mac Owani__ *C.M.* in Musci MacOwanianis No. 19.—Transvaalia: in rupibus graniticis ad Houtbosh. R.
[= *Hedwigia albicans* (Web.) Lindb. *fide* Broth. Musci, p. 715.]

596b*__Hedwigia Mac Owani__ *C.M.* in Musci MacOwanianis No. 19.—Terra Capensis orientalis: in glareosis supra Graaf Reynett: leg. Mac Lea.

596c*__Hedwigia Mac Owani__ *C.M.* in Musci Mac Owanianis No. 19.—Natal: in rupibus circa Karkloof. R.

597 *__Braunia Mac Owaniana__ *C.M.* in Musci MacOwanianis No. 38. Transvaal: in monte Lechlaba supra locationem Mamabolo. R.
[= *Hedwigidium imberbe* (Sm.) Bry. eur. *fide* Broth. Musci, p. 717.]

598 *__Braunia diaphana__ *C.M.*—Transvaal: in rupestribus circa Houtbosh. R.
[= *B. secunda* (Hook.) Bry. eur. *fide* Dixon in Smithson. Misc. Colls. 72, No. 3, p. 10.]

598b*__Braunia diaphana__ *C.M.*—Transvaalia: in monte Lechlaba sub vertice Snellskop. R.

598c*__Braunia diaphana__ *C.M.*—Terra Capensis orientalis: in rupibus montis "Cave Mountain" supra Graaf Reynett: leg. Mac Lea.

599 *__Aulacopilum trichophyllum__ *Angstr.* in sched. ?—Transvaalia: in arborum truncis ad margines silvarum in mont. supra Houtbosh.

600 *__Cryphaea exigua__ *C.M.*—Transvaalia: in mont. Lechlaba supra Houtbosh.

601 *__Leptodon Smithii__ (*Dicks.*).—Terra Capensis orientalis: leg. Mac Lea.

602 __Leptodon mollis__ *Rehm.* n.sp.—Transvaalia: in montibus supra Houtbosh.

602b **Leptodon mollis** *Rehm.* n.sp.—Transvaalia: in mont. supra Lydenburg leg. Mac Lea.

603 **Pterogonium gracile** *L.* var. **capensis** *Rehm.* Exsicc. n. 318.—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

604 ***Asterodontium sericeum** *Hrnsch. Leucodon sericeus* Rehm. Exsicc. n. 321.—Transvaalia: in mont. Kwatlamba supra Lydenburg: leg. Mac Lea.
[See note on No. 321.]

604b***Asterodontium sericeum** *Hrnsch. Leucodon sericeus* Rehm. Exsicc. n. 321.—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

605 ***Leucodon assimilis** *C.M.*—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

605b***Leucodon assimilis** *C.M.*—Transvaalia: in monte Kwatlamba supra Lydenburg: leg. Mac Lea.

606 **Prionodon africanus** *Rehm.* n.sp.—Transvaalia: in mont. supra Lydenburg: leg. Mac Lea.

606b **Prionodon africanus** *Rehm.* n.sp.—In mont. supra Houtbosh. R.

607 ***Aerobryum capense** *C.M.* typus!—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

608 **Aerobryum capense** *C.M.* var. **rupestre** *Rehm.*—Transvaalia: in mont. Lechlaba supra Houtbosh ad arb. truncos. R.

609 ***Pilotrichella chrysoneura** *C.M.*—Transvaalia: in mont. Kwatlamba supra Lydenburg: leg. Mac Lea.

609b***Pilotrichella chrysoneura** *C.M.*—Transvaalia: in monte Lechlaba supra Houtbosh. R.

610 **Pilotrichella Rehmanni** *C.M.* in Rehm. Exsicc. nr. 323.—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

611 **Papillaria floribundula** *C.M.* var. **Mac Leana** *Rehm.*—Transvaalia: in mont. Kwatlamba supra Lydenburg: leg. Mac Lea.
[*Floribundaria floribundula* (C.M.) Fleisch.]

612 **Papillaria nitidula** *Rehm.* n.sp.—Transvaalia: in monte Lechlaba supra Houtbosh. R.

613 ***Papillaria africana** *C.M.* typus!—Transvaalia: in monte Lechlaba supra Houtbosh. R.

614 **Papillaria africana** *C.M.* var. **natalensis** *Rehm.* Exsicc. nr. 325.—Transvaalia: in mont. Kwatlamba supra Lydenburg: leg. Mac Lea.

615 **Neckera natalensis** *Rehm.* n.sp.—Natal: loco non designato: leg. Buchanan.

616 **Neckera Mac Leana** *Rehm.* n.sp.—Transvaalia: in mont. supra Lydenburg.

617 **Neckera capensis** *Br. et Sch.*—Transvaalia: in mont. supra Lydenburg: leg. Mac Lea.
[See note on No. 327.]

618 **Neckera capensis** *Br. et Sch.* var. **laevigata** *Rehm.*—Transvaalia: in mont. supra Houtbosh. R.

619 ***Trachyloma africanum** *Rehm.* Exsicc. nr. 337.—Transvaalia : in mont. supra Lydenburg : leg. Mac Lea.
[No. 337 should be 332. = *Renauldia Hoehnelii* (C.M.) Broth. *fide* Dixon in Journ. of Bot. 1915, p. 22.]

620 ***Porotrichum pennaeforme** *C.M.* c. fr.—Transvaalia : in sylvat. montium Kwatlamba supra Lydenburg : leg. Mac Lea.

621 ***Porotrichum pterops** *Rehm.* (Exsicc. nr. 329, sub *Neckera*).—Transvaalia : in mont. supra Lydenburg : leg. Mac Lea.
[See note on No. 329.]

621b***Porotrichum pterops** *Rehm.* (Exsicc. nr. 329, sub *Neckera*).—Transvaalia : in monte supra Houtbosh. R.

622 **Hookeria Natalensis** *Rehm.* exsicc. nr. 338 (sub *Pterygophyllo*). — Natal : ad stationem Umpomulu : leg. Buchanan.
[See note on No. 338.]

622b **Hookeria Natalensis** *Rehm.* Exsicc. nr. 338 (sub *Pterygophyllo*).—Natal : in umbrosis montis Inanda : leg. J. Wood.

623 **Hookeria macropyxis** *Rehm.* Exsicc. nr. 339.—Natal : ad saxa irrorata montis Inanda : leg. J. Wood.
[See note on No. 339.]

624 ***Callicostella tristis** *Rehm.* Exsicc. nr. 342. typus !—Natal : ad saxa irrorata montis Inanda : leg. J. Wood.

625 ***Callicostella tristis** *Rehm.* Exsicc. nr. 342 forma *tenella*.—Transvaalia : in mont. Mahaliesberge (?) : leg. Mac Lea.

626 ***Callicostella tristis** *Rehm.* Exsicc. nr. 342 forma *densifolia*.—Transvaalia : in mont. Kwatlamba supra Lydenburg : leg. Mac Lea.

627 **Fabronia Rehmanni** *C.M.* in Rehm. Exsicc. nr. 347 var. **julacea.**—Natal : ad truncos *Syzygii* prope Maritzbourg. R.

628 **Fabronia auro-nitens** *Rehm.* n.sp.—Terra Capensis orientalis : in monte Rhenosterberg : leg. Mac Lea.

629 **Fabronia hypnoides** *Rehm.* n.sp.—Transvaalia : ad truncos *Faureae* circa Houtbosh. R.

630 **Fabronia sp.** (non exam.).—Terra Capensis orientalis : in arboribus et rupibus montis Rhenosterberg : leg. Mac Lea.
[The Kew specimen is written up by Brotherus "*densifolia* Rehm."]

631 **Schwetschkea aristaria** *Rehm.* n.sp.—Transvaalia : in montibus Lechlaba supra Houtbosh ad arborum silvestrium truncos. R.

632 **Ischyrodon seriolus** *C.M.* var. **albicanus** *Rehm.* Exsicc. nr. 352.—Prom. Bonae Spei : ad *Quercuum* truncos in promenad. publica urbis (Cape Town). R.
[*albicanus* a slip for *albicans*.]

633 **Ischyrodon leptocladus** *Rehm.* n.sp. c.fr.—Prom. Bonae Spei: ad *Quercuum* truncos in promenada publica urbis (Cape Town). R.
[Not specifically distinct from *I. seriolus*, *fide* H.N.D.]

634 **Lepyrodon capensis** *Rehm.* n.sp.—Prom. Bonae Spei: ad arborum truncos in clivosis Montis Leonis. R.

635 **Leskea fallax** *Rehm.* n.sp.—Transvaalia: in mont. Lechlaba, ad arb. trunc. R.

636 **Leskea fallax** *Rehm.* n.sp., var. **robusta.**—Terra Capensis orientalis: in Cave Mountain supra Graaf Reynett ad arborum truncos: leg. Mac Lea. Obs. a varietatibus *Pseudoleskeae claviramea* capsula symmetrica facile diagnoscenda.

637 ***Anomodon pseudo-tristis** *C.M.*, Rehm. Exsicc. nr. 343.—Natal: Maritzburg, ad arborum truncos. R.
[See note on No. 343.]

638 **Anomodon Mac Leanus** *Rehm.* n.sp.—Terra Capensis orientalis: in monte Overhout supra Graaf Reynett: leg. Mac Lea.

639 **Anomodon robustus** *Rehm.* n.sp.—Natal: in mont. Kwatlamba ad Laingsneck. R.
[= *Herpetineuron Toccoae* (Sull.) Card. *fide* Salmon.]

639b **Anomodon robustus** *Rehm.* n.sp.—Transvaalia: in umbrosis mont. Kwatlamba supra Lydenburg: leg. Mac Lea.

640 **Pseudoleskea laxifolia** *Rehm.* n.sp.—Transvaalia: in mont. Lechlaba supra Houtbosh. R.

641 ***Pseudoleskea claviramea** *C.M.*—Terra Capensis orientalis: in mont. supra Graaf Reynett: leg. Mac Lea.

642 **Pseudoleskea claviramea** *C.M.* var. **aquatica.**—Transvaalia: in rivulis mont. Lechlaba supra Houtbosh. R.

643 ***Pseudoleskea Mac Owaniana** *C.M.* in Musc. MacOwanianis nr. 3.—Terra Capensis orientalis: ad saxa basaltica per sylvis montis Boschberg pone Somerset-East: leg. Mac Owan.

644 ***Thuidium torrentium** *C.M.* in Musc. MacOwanianis nr. 44.—Transvaalia: in silvis montium Lechlaba supra Houtbosh. R.

644b***Thuidium torrentium** *C.M.* in Musc. MacOwanianis nr. 44.—Transvaalia in montibus Kwatlamba supra Lydenburg: leg. Mac Lea.

645 ***Thuidium versicolor** *Hrnsch.*—Transvaalia: in umbrosis montium Kwatlamba ad Macmac: leg. Mac Lea.

646 **Thuidium tamariscinum** *Hedw.*—Transvaalia: in umbrosis mont. Kwatlamba ad Macmac: leg. Mac Lea.
[= *T. promontorii* C.M. in Hedwig. xxxviii, 150, *fide* H.N.D.]

647 **Thuidium thamniopsis** *Rehm.* n.sp.—Transvaalia: in umbrosis mont. Kwatlamba ad Macmac: leg. Mac Lea.

648 ***Entodon Dregeanus** *Hrnsch.*—Transvaalia: in mont. Kwatlamba supra Lydenburg: leg. Mac Lea.

648b*Entodon Dregeanus *Hrnsch.*—Transvaalia : in monte Lechlaba supra Houtbosh. R.

649 **Entodon Dregeanus** *Hrnsch.* var. **imbricatus.** *E. enervis* Rehm. Exsicc. n. 330.—Transvaalia : in umbrosis mont. Kwatlamba supra Lydenburg : leg. Mac Lea.

650 ***Entodon natalensis** *Rehm.* Exsicc. n. 331.—Transvaalia : in monte Kwatlamba supra Lydenburg : leg. Mac Lea.

651 **Brachythecium sp. No. 1.**—Transvaalia : in montibus Kwatlamba ad Pilgrimsrest : leg. Mac Lea.

652 **Brachythecium sp. No. 2.**—Transvaalia : in silvis montium Lechlaba ad Houtbosh. R.

653 **Brachythecium sp. No. 3.**—Transvaalia : in silvis montium Lechlaba ad Houtbosh. R.

654 ***Eurhynchium cavifolium** *Rehm.* Exsicc. n. 368.—Natal : in umbrosis montis Inanda : leg. J. Wood.
[See note on No. 368.]

654b***Eurhynchium cavifolium** *Rehm.* Exsicc. n. 368.—Transvaalia : in mont. Lechlaba supra Houtbosh. R.

655 ***Eurhynchium cavifolium** *Rehm.* Exsicc. n. 368 forma *tenella.*—Transvaalia : in mont. Lechlaba supra Houtbosh. R.

655b***Eurhynchium cavifolium** *Rehm.* Exsicc. n. 368 forma *tenella.*—Transvaalia : in mont. Kwatlamba ad Macmac : leg. Mac Lea.

656

656b **Eurhynchium Shawii** *Rehm.* Exsicc. n. 367.—Natal : in umbrosis montis Inanda : leg. J. Wood.

657 **Eurhynchium Mac Leanum** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Macmac : leg. Mac Lea.

658 **Eurhynchium ovatifolium** *Rehm.* n.sp.—Transvaalia : in mont. Kwatlamba ad Macmac : leg. Mac Lea.

659 ***Rhynchostegium Quinzii** *C.M.* = *Hypnum Quinzii* Rehm. Exsicc. n. 409 var. **julascens.**—In montibus Outenikwa, supra Montagu Pass. R.
[*Quinzii* should read *Gueinzii.* *Rhaphidostegium* Jaeg.]

660 **Rhynchostegium sp. No. 1.**—Transvaalia : in montibus Kwatlamba supra Lydenburg : leg. Mac Lea.
[All these species 659–664 belong to *Rhaphidostegium.*]

661 **Rhynchostegium sp. No. 2.**—Transvaalia : loco non designato : leg. Mac Lea.

662 **Rhynchostegium sp. No. 3.**—Natal : in umbrosis montis Inanda : leg. J. Wood.

663 **Rhynchostegium sp. No. 4.**—Natal : in umbrosis montis Inanda : leg. J. Wood.

664 **Rhynchostegium sp. No. 5.**—Transvaalia : in mont. Kwatlamba supra Pilgrimsrest : leg. Mac Lea.

665 ***Microthamnium pseudo-reptans** *C.M.* (*Hypnum* sp. Rehm. Exsicc. nr. 418).—Transvaalia : in mont. Kwatlamba supra Pilgrimsrest : leg. Mac Lea.

665b*__Microthamnium pseudo-reptans__ *C.M.* (*Hypnum* sp. Rehm. Exsicc. nr. 418).—Transvaalia: in umbrosis mont. Lechlaba ad Houtbosh. R.

665c*__Microthamnium pseudo-reptans__ *C.M.* (*Hypnum* sp. Rehm. Exsicc. nr. 418).—Natal: in umbrosis montis Inanda: leg. J. Wood.

666 *__Microthamnium pseudo-reptans__ *C.M.* forma *umbrosa*.—Transvaalia: in monte Kwatlamba supra Pilgrimsrest: leg. Mac Lea.

667 *__Plagiothecium membranosulum__ *C.M.* in Rehm. Exsicc. n. 389.—Natal: in monte Inanda ad rivulos: leg. J. Wood.

668 __Amblystegium riparium__ *L.* var. __rivulare.__ *Hypnum fluitans* Rehm. Exsicc. n. 399, 400 (non L.).—Transvaalia: in rivulis montium Kwatlamba ad Macmac: leg. Mac Lea.

669 __Amblystegium riparium__ *L.* var. __rivulare__ forma *robusta*.—Transvaalia: in rivulis montium Kwatlamba ad Macmac: leg. Mac Lea.

670 __Hypnum Knuthei__ *Rehm.* n.sp.—Transvaalia: in montis Lechlaba, ad Houtbosh. R.

671 __Hypnum lechlabense__ *Rehm.* n.sp.—Transvaalia: in monte Lechlaba ad Houtbosh. R.

672 __Hypnum gracillimum__ *Rehm.* n.sp.—Natal: in umbrosis montis Inanda: leg. J. Wood.

673 __Hypnum argenteum__ *Rehm.* n.sp.—Natal: in umbrosis montis Inanda: leg. J. Wood.

674 __Hypnum natalense__ *Rehm.* n.sp.—Natal: in umbrosis montis Inanda: leg. J. Wood.

675 __Hypnum brevifolium__ *Rehm.* n.sp.—Natal: in paludosis ad Maritzburg. R.
[= *H. natalense* Rehm. *fide* Par. Index.]

675b __Hypnum brevifolium__ *Rehm.* n.sp.—Natal: in paludosis montium Kwatlamba ad Laingsneck. R.

676 __Hypnum flaccidulum__ *Rehm.* n.sp.—Terra Capensis orientalis: in uliginosis montis Rhenosterberg: leg. Mac Lea.

677 __Hypnum Mac Leanum__ *Rehm.* n.sp.—Transvaalia: in mont. Mahaliesberge (?) locis non design.: leg. Mac Lea.

678 *__Hypnum anotis__ *C.M.*—Natal: in humidis mont. Inanda. Obs. *H. crassicaule* Rehm. Exsicc. n. 414a et b est hujus forma *palustris* robusta. leg. J. Wood.
[See note on No. 414.]

679 __Hynum afro-purum__ *Rehm.* Exsicc. n. 403. *H. basalticum* C.M. in Musc. MacOwanianis, n. 37.—Transvaalia: in monte Lechlaba supra Houtbosh. R.

679b __Hypnum afro-purum__ *Rehm.* Exsicc. n. 403. *H. basalticum* C.M. in Musc. MacOwanianis, n. 37.—Terra Capensis orientalis: in monte Cave Mountain (Oudeberg): leg. Mac Lea.

680 ***Hypnum amplexicaule** *Rehm.* Exsicc. n. 392.—Transvaalia: in mont. Kwatlamba supra Lydenburg: leg. Mac Lea.
[See note on No. 392.]

## Corrections of Errors in Paris, Index, Ed. II, in regard to Rehmann's M.A.A.

Dr. Sim has drawn up a list of errors detected by him in the above work, to which we have added some further ones. It seems worth while to put these on record, and on the whole more convenient if brought together than if noted under their respective numbers.

| | | | | |
|---|---|---|---|---|
| VOL I | sub | *Anomobryum procerrimum.* | for 219 | read 214 |
| | ,, | *Barbula syrrhopodontoides.* | ,, 176 | ,, 476 |
| | p. 137 | Insert "*Brachythecium afro-velutinum* C.M. in Hedw. xxxviii, 135 (Rehm. M.A.A. n. 379). | | |
| | sub | *Bryum amplirete* | add n. 249. | |
| | ,, | *B. Haamii* | for *Haamii* | read *Haanii* |
| | ,, | *B. rochropyxis* | ,, 283 | ,, 233 |
| | ,, | *B. promontorii* | ,, *procumbens* | ,, *procerrimum.* |
| | | The whole entry should be placed under *Anomobryum procerrimum.* See, however, note on No. 219 in the above list. | | |
| | ,, | *B. radicale* | add n. 245 | |
| | ,, | *B. subdecursivum* | for 277 | read 254 |
| | | *B. syntrichioides* is to be found under *Rhodobryum.* | | |
| | ,, | *Campylopus leucobasis* var. *bartramiaceus* | for 32 | read 55 |
| VOL. II | sub | *Ditrichum capense* var. *Vallis-gratiae* | ,, 185 | ,, 85 |
| | ,, | *Entodon Dregeanus* var. *imbricatus* "n. 330" should be transferred to the next line, sub *E. enervis.* | | |
| | ,, | *Eurhynchium ovalifolium.* | read *ovatifolium* | |
| | ,, | *Glyphocarpus comosus* | for 86 | read 187 |
| | ,, | *Goniomitrium africanum.* No. 518 was issued as *Rehmanniella africana,* and should be transferred to the next line. | | |
| | ,, | *Hookeria Pappeana* | for *megalopyxis* | read *macropyxis.* |
| | ,, | *Hyophila atrovirens* | ,, 495 | ,, 475 |

VOL. III sub *Hypnum afro-fluitans* for 299 read 399
„ *Ischyrodon seriolus* „ 179 „ 353
„ *Leptodontium transvaaliense.* This entry is altogether incorrect, through confusion with *Trichostomum sulfureum* C.M. from Nicaragua. The South African plant is a *Trichostomum* (or *Tortella*) and should be placed under that genus.
„ *Lepyrodon capensis* add n. 634.
„ *Leuchobryum africanum* for 156 read 456
„ *Leucobryum Gueinzii* delete No. 75
„ *Leucoloma Rehmannii* for 296 „ 29b
„ *Mielichhoferia procerrima* for *Bryum Promontorii* read *Anomobryum.*
„ *Neckera natalensis* add n. 615
„ *Philonotis afro-fontana.* Both the varieties are out of their place: they belong to *P. afro-uncinata*, not to *P. afro-fontana.*
„ *Philonotis pernana* for *Bartramia pernana* C.M. in Rehm. M. Afr. austr. n. 146 read *Glyphocarpus pernanus* C.M. in Rehm. M. Afr. austr. n. 191.

VOL. IV sub *Pseudoleskea capilliramea* for *Hypnum leskeifolium* C.M. in Rehm. M. Afr. austr. n. 139 read *Brachythecium leskeifolium* C.M. in Rehm. n. 373.
„ *Pterygophyllum mniaceum.* The number for *Pt. Rehmanni* should be 337, and that for *Pt. sublucens* 336.
„ *Rhacocarpus cuspidatus.* *R. gracillimus* is the published name, and *R. cuspidatus* (nomen nudum) the synonym.
„ *Rhacocarpus piliferus.* *R. Ecklonianus* is the published name, and *R. pilifer* the synonym.
„ *Rhacocarpus Rehmanni* for 270 read 311
„ *Rhaphidostegium dentigerum* „ 331 „ 419
„ *Rhodobryum leptothrix.* See note on No. 554 in the above list.
„ *Schlotheimia cuspidata.* *S. percuspidata* is the published name and *S. cuspidata* (nomen nudum) the synonym.
„ *Sphagnum capense* (*S. austro-molle*) for 166 read 16b

VOL. V sub *Zygodon perreflexus* for 297 read 148
„ *Z. runcinatus* „ 150, 164
311, 317 „ 150, 150b
„ *Z. trichomitrius* „ 54, 149 „ 149, 498

THE FOLLOWING ARE OMITTED BY PARIS.

*Atrichum nudifolium*
*Amblystegium riparium* var. *rivulare*
*Barbula plicata*
*Brachythecium afro-velutinum*
*B. truncorum*
*Braunia flagellaris*
*B. pseudo-diaphana.*
*Bryum afro-turbinatum*
*B. argutidens*
*B. chrysoloma*
*B. laxe-gemmaceum*
*B. monilicaule*
*B. syntrichiaefolium*
*B. tenerrimum*
*Campylopus bartramiaceus*
*C. latifolius*
*C. Schenkei*
*C. Sudabyanus*
*C. tenellus*
*C. turgidus*
*Entosthodon crassipes*
*E. Kadzianus*
*Eurhynchium Mac Leanum*
*E. modestum*
*Fabronia oraniae*
*F. capensis*
*Funaria serrata Rehm.*
*Glyphocarpus comosus* var. *nanus*
*Gymnostomum lingulatum*
*Hypnum odontophyllum*
*Mielichhoferia elongata Rehm.*
*Philonotis hyophila*
*P. natalensis*
*Pottia verrucosa*
*Pogonatum tortifolium*
*Schwetschkea aristaria*
*Syrrhopodon pyriformis*
*Thuidium thamniopsis*
*Trematodon tortilis*
*Webera glandiformis*
*Zygodon affinis*

SOME CORRECTIONS IN CONTRIBUTIONES AD BRYOLOGIAM AUSTRO.-AFRAM, BY C. MUELLER, IN HEDWIGIA, XXXVIII, pp. 52–154.

Errors in citing Rehmann's Numbers :—

(C.M. has at least three different ways of citing Rehmann's Exsiccata in the above paper, the most usual being "Rehmann, Coll. No. 71," &c. A good many of the numbers so cited, however, are not the Exsiccata numbers, but herbarium numbers of Rehmann's, which are usually, but not by any means always, distinguished by being cited thus—"Rehmann sub No. 103."

The species in that paper are numbered consecutively, and the number is given below as well as the page, for convenience of reference),

| | | | | | | |
|---|---|---|---|---|---|---|
| p. 75 | No. 59 | for 277 | read 254 | | | |
| 93 | ,, 105 | ,, 146 | ,, 191 | | | |
| 114 | ,, 164 | ,, 379 | ,, 499 | | | |
| 114 | ,, 165 | ,, 150b, 311, 317, 164 | read 150, 150b. | | | |
| 115 | ,, 167 | ,, 54 | read 498 | | | |
| 115 | ,, 168 | ,, 297 | ,, 148 | | | |
| 130 | ,, 211 | ,, 43 | ,, 335 | | | |
| 139 | ,, 235 | to Coll. Musc. A-A. | add No. 373 | | | |
| 146 | ,, 255 | for 331 | read 419 | | | |

148 No. 260 "No. 139, sub *Hypno leskeifolio*" should presumably read "No. 373, sub *Brachythecio leskeifolio*." It is to be noted that C.M. has here described the same specimen twice, and under two distinct genera !

The following corrections may also be made :—

On p. 121, No. 183, C.M. describes *Grimmia austro-patens* n. sp., based on Rehmann's No. 137. The name is already, however, pre-occupied by *G. austro-patens* C.M., Bryologia austro-Georgiae, p. 316 (1890). As both species belong to *Rhacomitrium*, the S. Georgian plant (if a valid species) retains the name. The S. African plant, however, as pointed out above, is certainly identical with *R. crispulum*, H.f. & W. Paris has several errors in connection with this name. (Ind. Ed. 2, Vol. IV, p. 148).

p. 100. No. 126. *Trichostomum leiodontium* n. sp. Referred by Brotherus to *Tortella xanthocarpa* (Schimp.). It may be desirable to point out here that Paris has confused two species in his Index, Ed. 2. Under *Barbula* the reading should be :—

*xanthocarpa* C.M. in Linnaea, xvii, 581 (1843). Syn. I. 619
2 — Prom. B. sp.

And under *Tortella* :—

*xanthocarpa* (Schimp.) Broth. op. et l. cc.
*Leptodontium xanthocarpum* Schimp. MS. in Musc. Breutel.
*Trichostomum xanthocarpum* C. M. in Hedwig. xxxviii, 99 (1899).
*Trichostomum leiodontium* C. M. in Hedwig. xxxviii, 100, *fide* Brotherus.

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## XX.—MISCELLANEOUS NOTES.

William Robson.—We record with regret the death on April 22nd of Mr. W. Robson, Agricultural Superintendent, Montserrat.

Mr. Robson was appointed from Kew in 1905 (K.B. 1905, 60), and spent the whole of his official career in Montserrat.

The Commissioner of Agriculture for the West Indies writes :—

"While Mr. Robson worked whole-heartedly in the general agricultural interests of the Presidency, he will be particularly remembered for the valuable services he rendered to the cotton industry; he carried on for many years important investigations which resulted in the production of a definite strain of cotton well suited to the requirements of the island. This strain of cotton won recognition at the hands of brokers and spinners and added materially to the welfare of the industry. In addition to this he rendered great assistance in all that pertained to the industry, both by his investigations bearing on the agriculture and general production of cotton and by the assistance which he

rendered to the cotton growers by way of direction and advice in all that concerned the industry.

The Annual Reports of his Department bear testimony to his activities and the wide-spread character of his interests."

---

**Solenostemma Argel in the Sahara.**—Amongst a number of drug plants collected in the French Sahara by Mr. Rodd, and recently received at Kew for identification from the Director of the Wellcome Chemical Research Laboratories, were specimens of *Solenostemma Argel* Hayne. This is a member of the family *Asclepiadaceae* and has hitherto been known from Egypt, Nubia, Kordofan and Arabia Petraea. Mr. Rodd collected his specimens in the Central Sahara in Northern Air (or Asben) and this record forms an interesting western extension of the area covered by the species so far as is known from the material and literature found at Kew.

Mr. Rodd also states that the plant is called "Ghalisum" in Tamashegh and has similar curative properties to those of the "Agar" leaves from an unidentified tree also found in Air, but is more powerful, and its application (on camels only) is similar. The leaves of "Agar" are powdered and applied dry to septic sores, after these have been carefully washed, when the powder has curative and healing effects. "Ghalisum" may also be drunk or eaten by men as a blood cleanser. It has purgative properties and is said to make the patient drink plenty of water (? diuretic) or rather, perhaps, that the patient *should* drink plenty of water.

Muschler, Manual Fl. Egypt ii, 749 (1912) states that the local Arabian name for the plant is argel or hargel, and Hayne, Arzneygew ix. t. 38 (1853), gives an excellent figure and states that the leaves of the plant are used like those of senna.—W.B.T.

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**Citations of Generic Names in the Index Kewensis.**—When the Index Kewensis was compiled, the year 1735 was generally accepted as the starting-point for the nomenclature of genera, in accordance with the Laws of Botanical Nomenclature adopted by the International Botanical Congress at Paris in 1867. But in 1905, at the Vienna Congress, the year 1753 was fixed as the starting-point for both genera and species of Phanerogams (International Rules, Art. 19). Hence numerous references to the publication of genera given in the Index Kewensis are no longer valid, being prior to 1753. In such cases Dalla Torre et Harms, Genera Siphonogamarum (1900–1907), may be consulted for the earliest valid citation. So many genera are concerned that it is impracticable to re-insert them in a Supplement as it would entail undue expenditure of time. Among them are such well-known names as *Abies*, *Abrus*, *Acacia*, *Acalypha*, *Acanthus*, *Acer*, *Achillea*, *Achyranthes*, *Aconitum*, etc. Many now date from the first edition of the Species Plantarum (1753), and are

associated with the descriptions given in the fifth edition of the Genera Plantarum (1754), but others were treated as synonyms in these and later works of Linnaeus. Thus *Abies* is now referable to Link (1841), and *Abrus* should be attributed to Adanson (1763).

---

**Lilac Wood** (*Syringa vulgaris*, L.).—Very little appears to have been published about this wood and the following remarks are based on an examination of specimens grown at Kew. The wood is slow-growing, small, 4–8 in. in diameter, hard, close-grained, heavy; the sap-wood cream coloured or pale yellow, and in mature bushes confined to 10–13 annual rings; the heart-wood brown with irregular reddish marks of varying intensity, rather like the markings in "Brazilian tulip wood" (*Physocalymma scaberrimum*). The reddish marking imparts a distinct character to the wood. In a transverse section the marks appear as wavy rings roughly following the outline of the trunk but not confined to the course of definite annual rings. In a tangential section the reddish colour is very pronounced. Near the centre of the trunk or branch it is seen as well defined longitudinal lines but nearer the outside it appears as rather broad bands. In a radial section it is also seen in lines; the intervening wood in each case is flecked or slightly stained with red. The pores are very small and numerous particularly in the spring wood; they are not easily seen without a lens and even with a lens those in the late wood are not very clear. The medullary rays are very fine and evenly spaced, about 100 occupying the space of half an inch. They are scarcely visible without a lens. The wood works with a smooth, glassy surface, its working qualities being more nearly comparable with box than with any other well-known wood, although it is less dense than box. The finished surface is comparable with box and yew. Although too scarce to be of any commercial importance, it can be effectively used for small articles of turnery and those persons who cut down large bushes might have small dainty household articles manufactured after carefully seasoning the wood.—W.D.

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**Erratum.**—On p. 189, line 4 from bottom, for *varieties* read *rarities*.

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

No. 7] [1923

## XXI.—CONTRIBUTIONS TOWARDS A PHYLOGENETIC CLASSIFICATION OF FLOWERING PLANTS. II.*

J. Hutchinson.

### The Genera of Anonaceae.

In common with many other natural families of flowering plants, such as *Cruciferae*, *Umbelliferae*, *Papilionaceae*, etc., the family *Anonaceae* contains a certain number of purely artificial genera separated on very slender characters, so that theories based on their probable phylogeny and phytogeographical distribution should be deduced with considerable caution. And in such families there is much scope for the individual botanist to exercise his own particular views as to the best definition and disposition of the groups and genera. During the last hundred years the family *Anonaceae* has received the attention of many systematists, prominent amongst them being Baillon†, King‡ and Engler & Diels§ whilst R. E. Fries and W. E. Safford have independently done some admirable work on certain Tropical American groups, and a revised key to the African genera has also recently been published‖. In spite of the considerable amount of taxonomic work on the family, however, no classification has as yet very satisfactorily resolved the genera into tribes, and several of the genera remain rather ill-defined. The present account should therefore be regarded as tentative. A future monographer would probably find it necessary to reduce considerably the number of genera, of which there are no less than ninety-five in the present enumeration. In the past, perhaps too much stress has been laid on the shape and size of the anther

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* Continued from *K. B.*, 1923, p. 89.

† Baillon, "Mémoire sur la fam. des Anonac.," Adansonia 8 : 162–184 295–344 (1867).

‡ King, "The Anonaceae of British India," Ann. Bot. Gard. Calcutta, 4 : 1–169, pl. 1–220 (1893).

§ Engler & Diels, Monogr. Afr. Anonac. 1–96, pl. 1–xxx (1901).

‖ Sprague & Hutchinson in *Kew Bull.* 1916, 145.

x (78)20089 Wt 396—P 32 1000 7/23 A

connective (see text figure), for tribal distinctions at any rate, this character being used very prominently by Bentham & Hooker.

Types of stamens in ANONACEAE: 1. *Desmos Stuhlmanni*. 2. *Popowia congensis*. 3, 4. *Popowia Schweinfurthii*. 5. *Popowia fornicata*. 6. *Orophea Thorelii*. 7. *Anonidium Mannii*. 8. *Polyalthia Oliveri*. 9. *Artabotrys Harmandii*. 10. *Xylopia africana*. 11. *Popowia Barteri*. 12. *Sageraea Hookeri*. 13. *Popowia fornicata*. 14. *Oxandra laurifolia*. 15. *Desmos Mesnyi*. 16. *Asimina triloba*.

In the present revision, the *Monodoroideae* are regarded as sufficiently distinct to be classed as a subfamily, on account of their carpels being united into a one-celled ovary, with parietal placentation, which is a great advance on the general structure of the gynaecium, and on account of their gamopetalous corolla. The remainder of the family is divided into three tribes, the first, *Uvarieae*, showing the most primitive features in that either one or both rows of petals are imbricate, and the anther-connective almost invariably truncate and hiding the thecae, reminding one very much of those of *Cycadaceae* and some *Pinaceae*. It is suggested that this type of anther shows relationship, very remote though it may be, with these more ancient groups.

The second tribe, *Miliuseae*, is distinguished by its valvate petals, but more especially by the outer petals being shorter than the inner, and often scarcely different from the sepals, resembling them in shape, texture, and possibly also in colour.

The third and by far the largest tribe is the *Unoneae*, in which the petals are also valvate, but they are equal or subequal in size or the inner may be much modified and smaller than the outer, sometimes being connivent and closely adpressed over the genitalia. I have had to be content with arranging the genera of this tribe into two subtribes, *Xylopineae* and *Anonineae* determined by the apocarpous and falsely syncarpous gynaccia respectively. Then the *Xylopineae* resolve themselves into three series, the *Hexapetalae*, *Tetrapetalae* and *Tripetalae*, according to the reduction in the number of the petals as indicated by their names. This arrangement, though undoubtedly rather artificial, reflects the comparatively rare tendency to reduction in the family, and will perhaps facilitate determination.

No doubt the bad state of dried specimens has contributed much to the unsatisfactory classification of this family, explained by the fact that they are found mostly in dense moist tropical forests, wherein the collection of herbarium material presents more than ordinary difficulty, for the flowers, being mostly fleshy, shrivel when dry and become very brittle.

Since the family was first monographed by Dunal in 1817, our knowledge has increased greatly through further exploration of the tropics. At that date only 103 species were known to botanists and most of these very imperfectly. In 1832, A. de Candolle's review brought to light 204 species, whilst Bentham & Hooker's estimate in 1862 was 400 species disposed through 40 genera. The present work accounts for 95 genera and a moderate estimate of something like 1150 species.* The botanical exploration of Tropical Africa has brought to light a considerable number of new genera, especially the forest area from Nigeria to the Congo, and particularly the Cameroons, where many small endemic and peculiar types have been discovered.

## Geographical Distribution of Anonaceae.

*Anonaceae* are almost wholly confined to the Tropics, where they generally grow at low elevations. For example they are very abundant in the rain-forest area of Western Africa, but nearly unrepresented in the adjacent and more elevated savannah regions. In Ceylon they do not ascend the mountains higher than 2000 metres, and in the Khasia Hills of Assam not beyond about 1600 metres. In Brazil their greatest elevation is probably about 1300 metres. The only genus extending for any distance into the temperate zone is *Asimina*, which occurs in Eastern America as far north as the Great Lakes.

There is a marked contrast in the habit of the species of the two hemispheres. In the tropics of the Old World they are usually of climbing or straggling habit, and occur in dense forest areas; but in Tropical America they are nearly all shrubby or arboreal and mostly grow on the campos or open grassy plains.

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* The genus *Eupomatia* R. Br. is considered to be a distinct family and is not included.

Examples of intercontinental distribution or affinity are not numerous, but they are of considerable interest. The only large natural genus common to the tropics of both hemispheres is *Xylopia* (see map), which is remarkable in the family in having transversely septate anthers. The small Brazilian genera *Cardiopetalum* and *Hornschuchia* also show this character. A new species of *Xylopia* recently discovered in the Cameroons (*X. hypolampra*) described by Dr. Mildbraed shows close affinity with certain Brazilian species. But the most remarkable instance of disconnected distribution in the case of a very natural and outstanding genus is *Anaxagorea*, which is common to Central and North Western South America and Indo-Malaya (see map). Besides the genus *Xylopia* there are two other notable examples of affinity between Africa and Indo-Malaya, namely, the relatively primitive and extensive genus *Uvaria* (see map) and the genus *Artabotrys* with its peculiar hooked inflorescences. Two other genera, *Popowia* and *Polyalthia*, are also common to these two regions, but with less significance from a geographical point of view, for neither could be described as a natural genus, as it has evidently been a receptacle for species not easily otherwise classified. In the Indo-Malayan region, *Sageraea* conforms exactly with Wallace's western area, whilst *Phaeanthus* is common to both parts.

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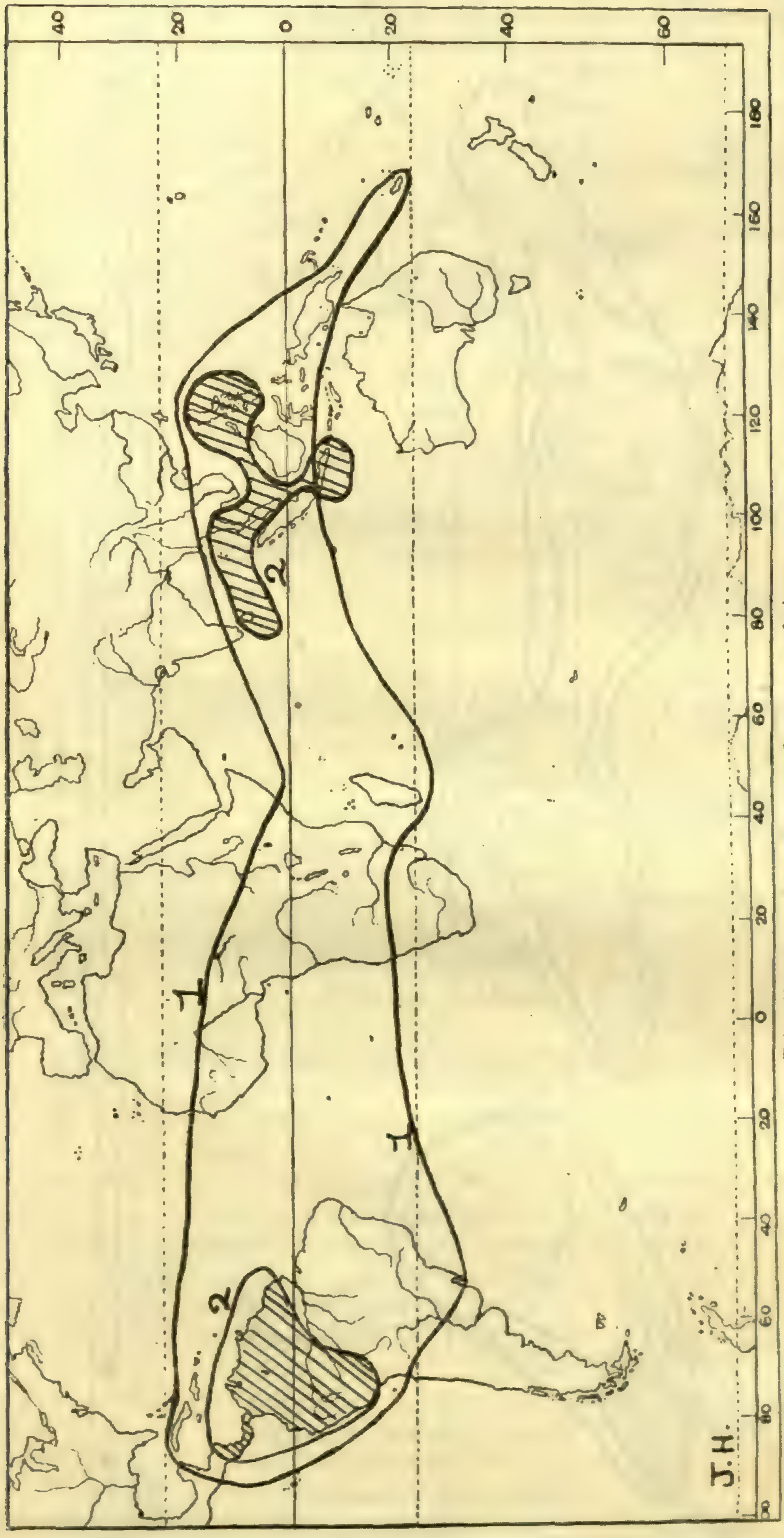
## Key to the Groups of Anonaceae.

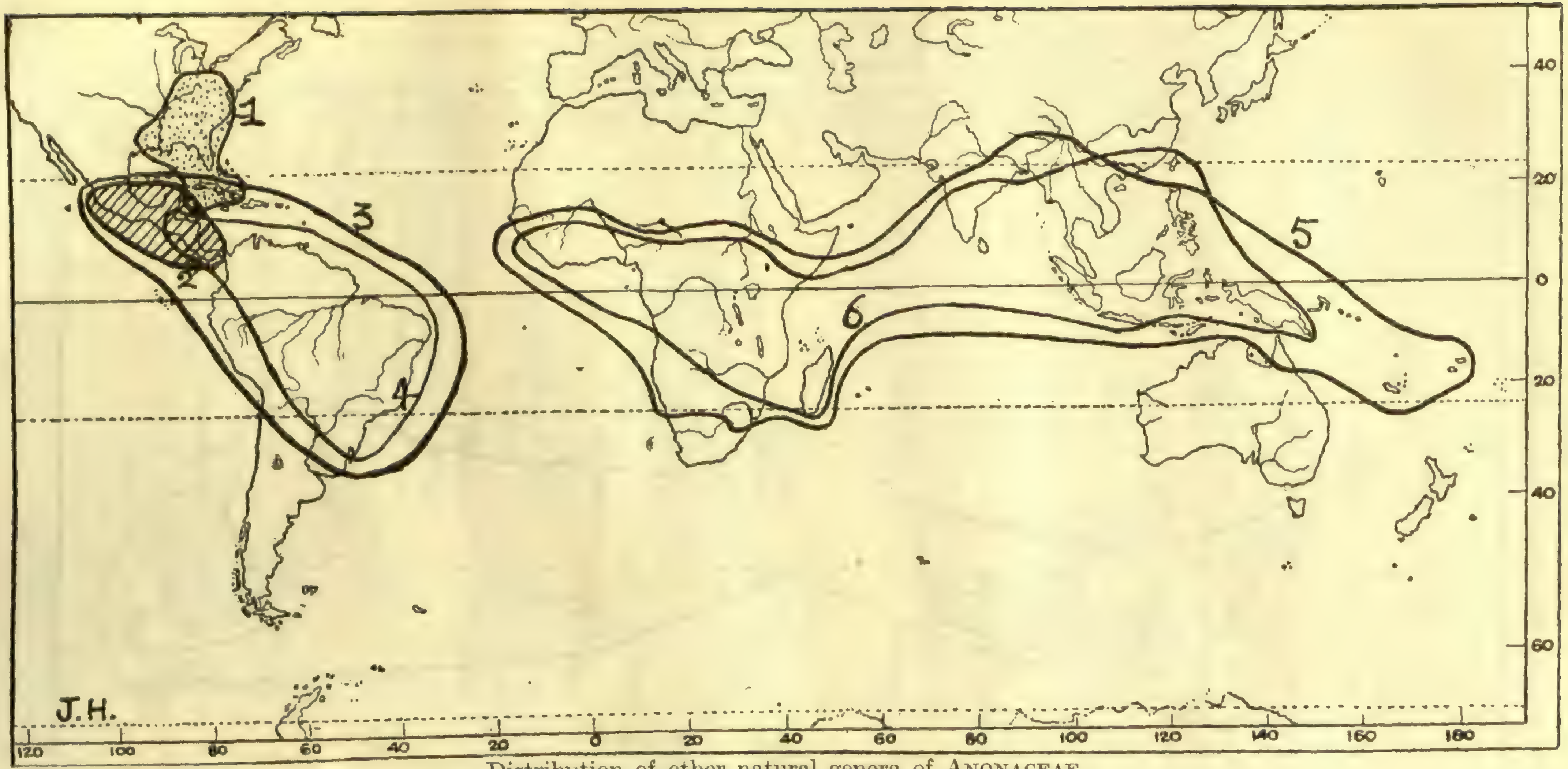
Subfamily I. **ANONOIDEAE.** Carpels free or if united forming a many-celled syncarp; stigmas erect.

| | |
|---|---|
| Petals always in two series, both or only the inner series imbricate; indumentum of the leaves usually stellate or lepidote | Tribe I. Uvarieae. |
| Petals all valvate, either in two distinct series or rarely in one series, usually 6, rarely 4, more rarely 3, in the latter case either the inner or the outer series missing :— | |
| Outer three petals smaller than the inner ones and often scarcely distinguishable from the sepals | Tribe II. Miliuseae. |
| Outer petals as large or larger than the inner and distinct from the sepals or sometimes by reduction only one series of 3 present - - - - - - - | Tribe III. Unoneae. |




Distribution of two natural genera of ANONACEAE.

1. The only cosmopolitan genus, *Xylopia*. 2. The small genus of closely allied species, *Anaxagorea*.




Distribution of other natural genera of ANONACEAE.
1. *Asimina*. 2. *Sapranthus*. 3. *Guatteria*. 4. *Duguetia*. 5. *Uvaria*.
6. *Artabotrys*.

| | |
|---|---|
| Carpels not united or if slightly so then always quite free in fruit - - - - | Subtribe i. XYLOPINEAE. |
| Petals 6 - - - - | Series 1. *Hexapetalae.* |
| Petals 4 - - - - | Series 2. *Tetrapetalae.* |
| Petals 3 - - - - | Series 3. *Tripetalae.* |
| Carpels united into a fleshy mass, especially in fruit - | Subtribe ii. ANONINEAE. |

Subfamily II. **MONODOROIDEAE.**
Carpels united into a 1-celled ovary with parietal placentas; stigmas radiating.

## KEY TO THE GENERA.

Subfamily I. **ANONOIDEAE** (to genus 93, p. 225).
Tribe I. UVARIEAE (genera 1–27).

*Petals 6; sepals 3:
†Flowers borne on the branches, never from underground shoots:
‡Calyx imbricate; Old World genera except *Malmea* and *Oxandra*:
Ovules numerous (6 or more):

| | |
|---|---|
| Flowers in fascicles on the older wood remote from the leaves; torus conical or hemispherical | 1. **Stelechocarpus.** |
| Flowers usually axillary; torus flat; carpels few - - - | 2. **Sageraea.** |

Ovules 1–2:

| | |
|---|---|
| Petals shorter than or equal to the sepals, all striate-nervose; anther-connective pilose - | 3. **Marcuccia.** |

Petals longer than the sepals:

| | |
|---|---|
| Calyx becoming membranous and much enlarged, hiding the fruit; sepals and petals striate - - | 4. **Sphaerothalamus.** |

Calyx not enlarging in fruit, mostly deciduous:
Anther-connective truncate at the apex; stamens numerous:
Flowers on the young branches or on the stem, not leaf-opposed; Old World:
Flowers on the young or one-year old branchlets; petals

not gibbous in the middle - - - 5. **Griffithianthus.**
Flowers on the main stem or branches; petals gibbous in the middle - - - 6. **Enicosanthum.**
Flowers in a leaf-opposed inflorescence; Trop. Amer. - - - - 7. **Malmea.**
Anther-connective lanceolate; stamens 10–15; Trop. Amer. - - - 8. **Oxandra.**

‡‡Calyx valvate :
§Carpels free from each other, at least in fruit :
‖Ovules numerous (6 or more) :
Petals not united at the base :
Trop. Amer. genera :
Flowers small, about 1 in. long; petals not striate; Peru - - 9. **Porcelia.**
Flowers large, over 3 in. long; petals conspicuously striate; Cent. Amer. - - - - 10. **Sapranthus.**
Old World genera :
All the petals remaining incurved; flowers small 11. **Cyathostemma.**
Inner petals without glands at the base, at length spreading - - 12. **Uvaria.**
Inner petals with two basal glands, remaining erect - - - - 13. **Anomianthus.**
Petals connate at the base into a distinct tube :
Anthers not transversely locellate; East Africa - 14. **Asteranthe.**
Anthers transverselylocellate; Brazil - - - 15. **Cardiopetalum.**

‖‖Ovules 1–3 :
Ovule inserted above the middle of the carpel; Malaya 16. **Ellipeia.**
Ovules inserted near the base of the carpel :
Carpels more than 1 :
Flowers bisexual :
Outer petals much longer than inner and

spreading, the inner closely adpressed over the stamens and carpels; ovules 1–2; seeds tuberculate; Trop. Afr. - - 17. **Cleistopholis.**

Outer petals about equal to the inner in length, all open in flower; ovule 1:

Carpels sessile or nearly so in fruit:

Carpels numerous, beaked, crowded, with several flattened sides; Trop. Amer. - - 18. **Duguetia.**

Carpels few, not beaked, loose, rounded; Mal. Penins - - 19. **Uvariella.**

Carpels more or less stipitate in fruit; Trop. Amer. (see also *Popowia*) 20. **Guatteria.**

Flowers unisexual, dioecious (?) Brazil - 21. **Ephedranthus.**

Carpel 1; flowers fasciculate on the older branchlets; stamens about 12; stigma sessile, peltate; Mal. Penins. - - - 22. **Kingstonia.**

§§ Carpels united, especially in fruit:

All the stamens fertile; Trop. Afr.:

Ovules numerous; indumentum stellate - - 23. **Pachypodanthium.**

Ovule 1; indumentum not stellate - - - - 24. **Anonidium.**

Outer stamens not fertile, with petaloid appendages; Trop. Amer. - - - - - 25. **Fusaea.**

††Flowers borne on sucker-like underground shoots; indumentum stellate-lepidote; anther-connective not swollen above the cells; carpels closely crowded; Trop. Amer. - 26. **Geanthemum.**

**Petals 4; sepals 2; climber; Borneo - 27. **Tetrapetalum.**

## Tribe II.—Miliuseae (gen. 28–37).

Anther-connective widened and truncate at the apex :
- Margins of inner petals not or only slightly inrolled, petals hardly boat-shaped :
  - *Flowers solitary or subsolitary :
    - Inner petals not clawed :
      - Inner petals thick and concave at the base; pedicels short :
        - Inner petals more or less triangular in section in the upper part; Trop. Amer. - 28. **Heteropetalum.**
        - Inner petals subterete and acuminate in the upper part; Trop. Asia - - 29. **Marsypopetalum.**
      - Inner petals flat and rather thin; Trop. Asia - - - 30. **Phaeanthus.**
    - Inner petals clawed; Java - 31. **Trivalvaria.**
  - **Flowers in fascicles with simple pedicels; Trop. Afr. - - - 32. **Brieya.**
  - ***Flowers paniculate; styles united; Trop. W. Afr. - - 33. **Piptostigma.**
- Margins of the inner petals much inrolled, the inner petals thick and boat-shaped; flowers solitary, extra-axillary on slender stalks; Trop. Amer. - - - - - - 34. **Cymbopetalum.**

Anther-connective not truncate, more or less pointed :
- Inner petals broad, thick and concave at the base :
  - Flowers in rather dense clusters of small cymes - - - - - 35. **Mezzettiopsis.**
  - Flowers usually solitary on simple long slender pedicels - - - 36. **Saccopetalum.**
- Inner petals flat and thin, broad at the base - - - - - - 37. **Miliusa.**
- Inner petals clawed at the base and more or less connivent at the apex 79. **Orophea.**

## Tribe III.—Unoneae (gen. 38–93).

### Subtribe 1.—Xylopineae (genera 38–89).

Series 1.—*Hexapetalae* (genera 38–79).
- * Connective truncate or broadly triangular and more or less hiding the anther-cells :
  - †Ovules numerous (at least more than 2) :

‡ Petals of the two series similar and approximately of equal size, usually free from each other - - -

§ Anthers not transversely septate :

Petals not united at the base, at most slightly connivent :

Indumentum stellate or lepidote :

Flowers on the young shoots, solitary :

Indumentum lepidote ; Trop. Afr. - - - 38. **Meicarpidium.**

Indumentum stellate ; Malaya :

Carpels several - 39. **Rauwenhoffiia.**

Carpel solitary - 40. **Monocarpia.**

Flowers several together on the old wood ; petals sharply contracted at the base over the stamens and carpels ; Malaya, New Guinea - - - - 41. **Drepananthus.**

Indumentum, when present, of simple hairs :

New World genera :

Flowers leaf-opposed or terminal - - - 42. **Desmopsis.**

Flowers axillary ; petals short, broadly ovate - 43. **Trigyneia.**

Old World genera :

Fruit slender, very torulose or reduced to one seed - - - 44. **Desmos.**

Fruits thick, not torulose ; petals more or less spreading in the upper part :

Petals pointed, triangular - lanceolate, gradually narrowed from a broader base upwards and divergent ; pedicel bracteate - - - 45. **Meiogyne.**

Petals linear to obovate, spreading from above the broadened concave base which

remains closely adpressed against the stamens - - - 46. **Cyathocalyx.**
Petals shortly triangular-lanceolate or ovate often very thick, with flattened sides :
Carpels 2–3, not constricted between the seeds; New Guinea - - 47. **Oncodostigma.**
Carpels 3–4, not known in fruit; stigma pileate-capitate; Trop. West Afr. - - 48. **Alphonseopsis.**
Carpels about 12, slightly constricted between the seeds; Philipp. Isl. - - 49. **Guamia.**
Petals united into a tube at the base :
Petals transversely plicate in bud; Trop. Afr., Madag. 50. **Hexalobus.**
Petals not plicate in bud; New Guinea - - - 51. **Papualthia.**
§§Anthers transversely septate (see also *Cardiopetalum* in Tribe *Uvarieae*) - - - - - 52. **Xylopia.**
§§§Anthers not known; closely allied to preceding - - - 53. **Polyceratocarpus.**
‡‡Petals of the two series very dissimilar and usually very unequal in length, free from each other :
Carpels not sunk in the torus :
Trop. Asia :
Petals shortly united at the base; New Guinea - - 51. **Papualthia.**
Petals not united :
Inner petals not clawed - 54. **Melodorum.**
Inner petals clawed- - 55. **Mitrephora.**
Trop. Afr.; Inner petals not clawed - - - - - 56. **Uvariastrum.**
North and Cent. Amer. - - 57. **Asimina.**
Carpels sunk in the torus; Mascar. 58. **Pseudanona.**
‡‡‡Petals in a single series :
Carpels about 24, some of the stamens sterile; Trop. Afr. - 59. **Monanthotaxis.**

Carpels 6; stamens all fertile; N. Austral. - - - - 60. **Haplostichanthus.**

††Ovules 1–2:

Peduncles becoming indurated and thickened, hook-like; petals with a dorsal horn-like appendage; Trop. Old World - - - - 61. **Artabotrys.**

Peduncles not hooked:

Carpels more than 1:

Seeds neither triquetrous nor winged:

Petals subequal in length:

Trop. Amer.:

Petals not winged on the back - - - 62. **Unonopsis.**

Petals broadly winged on the back - - 63. **Rolliniopsis.**

Trop. Old World:

Style nearly as long as ovary, more or less slender and terete; New Guinea:

Carpels numerous - 64. **Schefferomitra.**

Carpels 3–6 - - 65. **Oreomitra.**

Style very short or almost absent:

All the petals more or less opening out in flower - - - 66. **Polyalthia.**

Inner petals remaining more or less incurved over the stamens and carpels and often somewhat connivent - - 67. **Popowia.**

Petals very unequal:

Petals united at the base 51. **Papualthia.**

Petals free or slightly connivent:

Petals with a contracted concave base; flowers extra-axillary; West Trop. Afr. - - 68. **Stenanthera.**

Petals not concave at the base:

Inner petals not clawed - - - 69. **Oxymitra.**

Inner petals clawed - 70. **Goniothalamus.**

Seeds triquetrous, winged, Fiji 71. **Richella.**

Carpel 1; Malaya - - - 72. **Mezzettia.**

**Connective lanceolate or not produced above the cells :
Carpels dehiscent; seeds black and shining - - - - - - - 73. **Anaxagorea.**
Carpels indehiscent :
Petals subequal :
Trop. Amer. :
Flowers on the young shoots; buds depressed-globose; carpels subglobose - - - 74. **Bocagea.**
Flowers on old leafless branches; buds oblong-linear; anthers multilocellate; carpels linear - - - - - 75. **Hornschuchia.**
Trop. Asia :
Connective of the stamens small and not conspicuous; petals more or less triangular and short - - - - 76. **Alphonsea.**
Connective of stamens very sharply pointed; petals strap-shaped, long - - - - 77. **Canangium.**
Petals very unequal :
Inner petals not longer than the outer, not clawed - - - 78. **Platymitra.**
Inner petals longer than the outer, clawed - - - - 79. **Orophea.**

Series 2. *Tetrapetalae.*

Carpels more than 1 :
Flowers hermaphrodite; petals linear; anther-connective rounded-truncate;
Malaya - - - - - - 80. **Disepalum.**
Flowers dioecious; petals ovate, free, thick; connective of stamens not produced; carpels hexagonal; Trop. Afr. - - - - - 81. **Tetrastemma.**
Flowers monoecious (?); petals ovate, connate into a tube; carpels terete; Trop. Afr. - - - - - 82. **Uvariopsis.**
Carpel 1; Mexico - - - - 83. **Tridimeris.**

Series 3. *Tripetalae.*

Ovules 2 or more :
Anther-connective truncate at the apex; flowers hermaphrodite :
Petals linear-lanceolate; Trop. Asia - - - - - - 84. **Dasymachalon.**
Petals ovate or suborbicular :
Petals large, subreniform, 3·5 cm. long; Trop. Asia - - 85. **Petalolophus.**

Petals small, ovate-orbicular, about 1 cm. long; Trop. Asia - 86. **Dennettia.**

Anther-connective not produced at the apex; cauliflorous; dioecious, on very long pedicels; Trop. Afr. - 87. **Thonnera.**

Ovule 1 :

Petals opposite the sepals; Trop. Afr. 88. **Enantia.**

Petals alternate with the sepals; Borneo - - - - - - 89. **Eburopetalum.**

Subtribe II. ANONINEAE.

Petals subequal; ovules numerous; Java - - - - - - - - 90. **Ararocarpus.**

Petals unequal; ovule 1 :

Petals free :

Connective produced beyond the anther-cells; flowers monoecious - 91. **Anona.**

Connective not produced beyond the anther-cells; S. Amer. - - 92. **Raimondia.**

Petals connate at the base, the outer enlarged into a thick spreading appendage - - - - - - 93. **Rollinia.**

Subfamily II. **MONODOROIDEAE,**

Trop. Afr., Madagascar.

Petals all alike; corolla small - - 94. **Isolona.**

Inner and outer petals very dissimilar, the latter larger with wavy margins - 95. **Monodora.**

## Subfamily I.—**ANONOIDEAE.**

### Tribe I.—UVARIEAE.

1. **Stelechocarpus** *Hk. f. & Thoms.*—5 spp. S.E. Ind. to Java; type sp. *S. Burahol*, Chittagong & Java.—King, Ann. Bot. Gard. Calcutta 4 : 3.
2. **Sageraea** *Dalz.*—7 spp. Ind. Penins., Ceylon, Burma to Mal. Archip.; type sp. *S. laurina*, Bombay.—King, Ann. Bot. Gard. Calcutta 4 : 5.
3. **Marcuccia** *Becc.* in Nuov. Giorn. Bot. Ital. 3 : 181, t. 3 (1871). —1 sp., *M. grandiflora*, Borneo.
4. **Sphaerothalamus** *Hk. f.*—1 sp., *S. insignis*, Borneo.—Becc. Nuov. Giorn. Bot. Ital. 3 : 189, t. 7.
5. **Griffithianthus** *Merr.* (*) in Philipp. Journ. Sci. Bot. 10 : 231, 1915; (*Griffithia*, Maing. ex King (1893), not Wight & Arn., 1834).—4 spp. Mal. Penins., Philipp. Isl.; type sp. *G. magnoliaeflorus*.—Ridl. Fl. Mal. Penins. 1 : 25.

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* I quite agree with Merrill's remarks in which he advocates the abolition of the name *Griffithia* for this genus, on account of the earlier use of the same name for certain Rubiaceous plants now referred to *Randia*. In such cases there is always the possibility of the earlier named group being again raised to generic rank, which would entail the renaming of the second group.

6. **Enicosanthum** *Becc.* in Nuov. Giorn. Bot. Ital. 3 : 183, t. 5, ff. 14–18.—1. sp., *E. paradoxum*, Borneo.
7. **Malmea** *R. E. Fries* in Arkiv. Bot. Stockh. 5. n. 4 : 3 (1906).—1 sp., *M. obovata*, Bahia, Brazil.
8. **Oxandra** *A. Rich.* in Sagra, Fl. Cubana, 2 : 45, t. 8 (1845).—1 sp., *O. laurifolia*, Cuba.
9. **Porcelia** *Ruiz & Pav.*—1 sp., *P. dependens*, Peru.
10. **Sapranthus** *Seem.* Journ. Bot. 4 : 369, t. 54 (1886).—3 spp., Cent. Amer.; type sp. *S. nicaraguensis*.
11. **Cyathostemma** *Griffith*—5 spp.; Malaya; type sp. *C. viridiflorum*, Mal. Penins.—King, Ann. Bot. Gard. Calcutta, 4 : 11.
12. **Uvaria** *Linn.* (incl. *Marenteria* Noronha)—110 spp.; S. China to N. E. Austral., New Caled., Fiji, Solomon Isl., Trop. & S. Afr., Madag.; type sp. *U. zeylanica*, Ceylon.—King, Ann. Bot. Gard. Calcutta, 4 : 14. Engl. Monogr. Afr. Anonac. 7.
13. **Anomianthus** *Zoll.*—1 sp., *A. heterocarpus*, Siam to Java.
14. **Asteranthe** *Engl. & Diels* Monogr. Afr. Anonac. 30, t. 8, B. (1901), (incl. *Asteranthopsis*, O. Kuntze).—1 sp. *A. asterias*, Mombasa, E. Afr.
15. **Cardiopetalum** *Schlechtd.* in Linnaea 9 : 328 1834; (*Stormia* S. Moore, 1895).—1 sp. *C. calophyllum*, Bras.—*See* R. E. Fries in Svenska Vet. Akad. Handl. 34 : n. 5, 38 (1900).
16. **Ellipeia** *Hk. f. & Thoms.*—14 spp., Malaya; type sp. *E. cuneifolia*, Mal. Penins.—King, Ann. Bot. Gard. Calcutta, 4 : 32.
17. **Cleistopholis** *Pierre ex Engl.* in Engl. & Prantl. Nat. Pflanzenf. Nachtr. 160 (1897).—6 spp., Trop. Afr.; type sp. *C. patens*, Sierra Leone to S. Nigeria.—Engl. Monogr. Afr. Anonac. 33, partly. Sprague & Hutch. Kew Bull. 1916 : 150.
18. **Duguetia** *St. Hil.*—20 spp., Cent. & Trop. S. Amer.; type sp. *D. lanceolata*, Bras. (*Aberemoa* Aubl. is an older name for this genus but *Duguetia* is included in the list of *nomina conservanda* of Vienna Congress 1905).
19. **Uvariella** *Ridl.* Fl. Mal. Penins. 1 : 35 (1922).—1 sp., *U. leptopoda*, Mal. Penins.
20. **Guatteria** *Ruiz & Pav.* (*); (incl. *Cananga* Aubl.); 80 spp., Cent. & Trop. S. Amer., W. Ind.; type sp. *G. glauca*, Peru. This genus needs revision.
21. **Ephedranthus** *S. Moore*, Trans. Linn. Soc. ser. 2. 4 : 296, t. 21 (1895).—1 sp. *E. parviflorus*, Brazil.
22. **Kingstonia** *Hk. f. & Thoms.* Fl. Brit. Ind. 1 : 93 (1872).—1 sp. *K. nervosa*, Mal. Penins.
23. **Pachypodanthium** *Engl. & Diels*, Notizbl. Bot. Gart. Berl. 3 : 55 (1900).—2 spp., Trop. Afr.; type sp. *P. Staudtii*,

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* Although *Cananga*, Aubl. (1775) antedates *Guatteria*, Ruiz. & Pav. (1794) I can see no useful purpose in the renaming of about 80 species by restoring the name *Cananga*, especially as there is already a generally recognised genus *Canangium* Baill. *Guatteria* is included in the list of *nomina conservanda* of the International Code.

Sierra Leone to Cameroons. *P. confine*, Cameroons.—Engl. Monogr. Afr. Anonac. 32.

24. **Anonidium** *Engl. & Diels*, Notizbl. Bot. Gart. Berl. 3 : 56 (1900).—2 spp. ; type sp. *A. Mannii*, S. Niger., Cameroons. *A. Laurentii*, Congo.—Engl. Monogr. Afr. Anonac. 36.
25. **Fusaea** *Safford* in Contrib. U.S. Nat. Herb. 18 : 64, f. 73–4 (1914).—1 sp., *F. longifolia*, French Guiana.
26. **Geanthemum** *Safford* in Contrib. U.S. Nat. Herb. 18 : 66, t. 41(1914).—2 spp.; type sp. *G. rhizanthum*, Rio Janeiro, Bras.; *G. cadavericum*, Brazil.
27. **Tetrapetalum** *Miq.* in Ann. Mus. Bot. Lugd. Bat. 2 : 1 (1865–6).—1 sp., *T. volubile*, Borneo.

## Tribe II.—Miliuseae.

28. **Heteropetalum** *Benth.*—1 sp., *H. brasiliense*, N.E. Brazil, Guiana.
29. **Marsypopetalum** *Scheff.* in Tijdschr. Nederl. Ind. 31 : 342 (1870).—1 sp., *M. ceratosanthes*, Java.
30. **Phaeanthus** *Hk. f. & Thoms.*—8 spp., Lower Burma and Andamans to New Guinea; type sp. *P. nutans*, Mal. Penins. to Molucc.—King, Ann. Bot. Gard. Calcutta, 4 : 152.
31. **Trivalvaria** *Miq.* in Ann. Mus. Bot. Lugd. Bat. 2 : 19 (1865–6). —2 spp., Java; type sp. *T. macrophylla*—Ic. Bogor. 1. 143, t. 48.
32. **Brieya** *De Wild.* in Fedde, Repert. 13. 383 (1914).—1 sp. *B. fasciculata*, Congo.
33. **Piptostigma** *Oliv.* in Journ. Linn. Soc. 8 : 158, t. 13, f. 1 (1865).—5 spp., W. Trop. Afr.; type sp. *P. pilosum*, S. Niger.—Engl. Monogr. Afr. Anonac. 54.
34. **Cymbopetalum** *Benth.*—5–7 spp., S. Mex. to Peru and Bras.; type sp. *C. brasiliense*, Brazil.
35. **Mezzettiopsis** *Ridl.* in Kew Bull. 1912 : 389.—1 sp., *M. Creaghii*, N. Borneo.
36. **Saccopetalum** *Benn.*—6 spp., India to East Austral.; type sp. *S. Horsfieldii*, Java.
37. **Miliusa** *Leschen.*—20 spp., Ceyl. to S. China and Java; type sp. *M. indica*, Ceyl, and S. Ind.—King, Ann. Bot. Gard. Calcutta, 4 : 154.

## Tribe III.—Uvarieae.

38. **Meiocarpidium** *Engl. & Diels* in Notizbl. Bot. Gart. Berl. 3 : 54 (1900).—2 spp. : type sp. *M. lepidotum*, Cameroons. *M. ugandense*, Uganda.—Engl. Monogr. Afr. Anonac. 30.
39. **Rauwenhoffia** *Scheff.* in Ann. Jard. Buit. 2 : 21 (1885).—2 spp., type sp. *R. siamensis*, Siam to Cambodia. *R. uvarioides*, Aru Isl.
40. **Monocarpia** *Miq.* Ann. Mus. Bot. Lugd. Bat. 2 : 12 (1865–6). —2 spp., Mal. Archip.; type sp. *M. euneura*, Borneo.

41. **Drepananthus,** *Maing. ex Hook. f.* Fl. Brit. Ind. 1 : 56 (1872). —4 spp., Malaya, New Guinea; type sp. *D. pruniferus*, Mal. Penins.—King, Ann. Bot. Gard. Calcutta, 4 : 48.
42. **Desmopsis** *Safford* in Bull. Torr. Bot. Club, 43 : 184 (1916). —5 spp., Cent. Amer.; type sp. *D. panamensis*, Panama.
43. **Trigyneia** *Schlecht.*—1 sp., *T. oblongifolia*, Brazil.
44. **Desmos** *Lour.* (*Unona*,* of most authors, not of Linn. f. which =*Xylopia*). — 25 spp., S. China, Indo-Malay.; type sp. *D. chinensis*, Hong Kong and Hainan, and in India to Philipp. (cult.).—King, Ann. Bot. Gard. Calcutta 4 : 53 (as sect. of *Unona*).
45. **Meiogyne** *Miq.* Ann. Mus. Bot. Lugd. Bat. 2 : 12 (1865–6).— 1 sp., *M. virgata*, Mal. Penins., Sumatra, Java, Borneo.
46. **Cyathocalyx** *Champ.* 4 spp., Indo-Malay; type sp. *C. zeylanicus*, Ceylon.—King, Ann. Bot. Gard. Calcutta 4 : 36.
47. **Oncodostigma** *Diels* in Engl. Bot. Jahrb. 49 : 143, f. 2 (1912). 1 sp. *O. leptoneura*, New Guinea.
48. **Alphonseopsis** *Bak. f.* in Rendle, Cat. Talb. Pl. Niger. 3. t. 1 (1913).—1 sp., *A. parviflora*, S. Nigeria.
49. **Guamia** *Merrill* in Philipp. Journ. Sci. Bot. 10 : 243 (1915).— 1 sp. *G. marriannae*, Philipp.
50. **Hexalobus** *A. DC.*—6 spp., Trop. Afr.; type sp. *H. senegalensis*, Senegal to Niger & Nile.—Engl. Monogr. Afr. Anonac. 55.
51. **Papualthia** *Diels* in Engl. Bot. Jahrb. 49 : 138, f. 1 (1912).— 8 spp., New Guin.
52. **Xylopia** *Linn.* (incl. *Unona* Linn. f. and *Waria* Aubl.) 100 spp. Tropics; type sp. *X. glabra*, W. Ind.
53. **Polyceratocarpus** *Engl. & Diels* in Notizbl. Bot. Gart. Berl. 3 : 56 (1900) (incl. *Dielsina* Kuntze).—1 sp., *P. Scheffleri*, Tanganyika Territory, Trop. East Afr.—Engl. & Diels, Monogr. Afr. Anonac. 67, t. 23.
54. **Melodorum** *Dun.* (incl. *Pyramidanthe* and *Mitrella*, Miq.).— 55 spp.; East India to S. Yunnan and N.E. Austral.: type sp. *M. latifolium*, Mal. Penins. & Archip. & Philipp.— King, Ann. Bot. Gard. Calcutta 4 : 129.
55. **Mitrephora** *Blume* (incl. *Beccariodendron* Warb.).—30 spp., S. India to S. Yunnan, Indo-China, Malaya to N.E. Austral.; type sp. *M. obtusa*, Mal. Penins. & Java.—King. Ann. Bot. Gard. Calcutta 4 : 111.
56. **Uvariastrum** *Engl.* Monogr. Afr. Anonac. 31. t. 10, f. b (1901). —4 spp., West Trop. Afr.; type sp. *U. Pierreanum*, Gaboon.
57. **Asimina** *Adans.*—11 spp., N. Amer., West Ind.; type sp. *A. triloba*, Gt. Lake Region to Texas.—Brit. & Br. Fl. N. Un. St. & Canad. ed. 2, 2 : 83. Small. Fl. S.E. Un. St. ed. 2 : 447.

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* See Safford, "*Desmos* the proper generic name for the so-called Unonas of the Old World," Bull, Torr. Club 39 : 501–508 (1912); also Merrill Philipp. Journ. Sci. Bot. 10 : 234 (1915).

58. **Pseudanona** *Safford* in Journ. Wash. Acad. Sci. 3 : 17 (1913).—2 (or 3) spp., Mauritius; type sp. *P. amplexicaulis.*
59. **Monanthotaxis** *Baill.* in Bull. Soc. Linn. Par. 2 : 878 (1890).—2 spp., Congo; type sp. *M. congensis.*—Engl. & Diels Monogr. Afr. Anonac. 53.
60. **Haplostichanthus** *F. Muell.* in Vict. Nat. 7 : 180 (1891).—1 sp., *H. Johnsonii,* Mt. Bartle Frere, N. Austral.
61. **Artabotrys** *R. Br.* (incl. *Ropalopetalum* Griff. and *Parabotrys* C. Muell.).—50 spp., Old World Tropics and Subtropics; type sp. *A. odoratissimum,* widely cult. S. India to Formosa.—King, Ann. Bot. Gard. Calcutta 4 : 38. Engl. Monogr. Afr. Anonac. 70.
62. **Unonopsis** *R. E. Fries* in K. Sv. Vet. Akad. Handl. 34 : pt. 5, 26, t. 4, ff. 3–8 (1900).—12 spp., West. Ind., Trop. S. Amer.; type sp. *U. angustifolia,* Brazil.
63. **Rolliniopsis** *Safford* in Journ. Wash. Acad. Sci. 6 : 197 (1916).—4 spp., Brazil; type *R. discreta,* Eastern Brazil.
64. **Schefferomitra** *Diels* in Engl. Bot. Jahrb. 49 : 152, f. 4 (1912).—1 sp., *S. subaequalis* New Guin.
65. **Oreomitra** *Diels* in Engl. Bot. Jahrb. 49 : 151 f. 3 (1912).—1 sp., *O. bullata,* New Guinea.
66. **Polyalthia** *Blume* (incl. *Monoon* Miq.).—about 90 spp., Old World Tropics; type *P. subcordata,* Java.
67. **Popowia** *Endl.* (incl. *Cleistochlamys* Oliv. and *Clathrospermum* Planch.).—55 spp., Old World Tropics; type sp. *P. pisocarpa,* Java.—Engl. Monogr. Afr. Anonac. 43.
68. **Stenanthera** *Engl. & Diels,* Notizbl. Bot. Gart. Berl. 3: 57 (1900).—7 spp., Trop. W. Afr.; type sp. *S. hamata,* Sierra Leone to Ivory Coast.—Engl. Monogr. Afr. Anonac. 67.
69. **Oxymitra** *Hk. f. & Thoms.*—35 spp., Indo-Mal. to Solomon Isl., and Trop. West Afr.; type sp. *O. cuneiformis,* Java.
70. **Goniothalamus** *Blume* (incl. *Atrutegia* Bedd.).—50 spp., S. and E. India, Malaya, New Guin.: type sp. *G. macrophyllus,* Java.—King in Ann. Bot. Gard. Calcutta 4 : 86.
71. **Richella** *A. Gray.*—2 spp., Fiji; type sp. *R. monosperma.*
72. **Mezzettia** *Becc.* Nuov. Giorn. Bot. Ital. 3 : 187 (1871) (incl. *Lonchomera* Hk. f. & Thoms, 1873).—7 spp. Mal. Penins. Borneo; type sp. *M. umbellata,* Borneo.
73. **Anaxagorea** *St. Hil.* (incl. *Rhopalocarpus* Teijsm.).—10 spp. Indo-Malaya, Cent. and S.E. Amer.; type sp. *A. javanica,* Java.—King. Ann. Bot. Gard. Calcutta 4 : 84.
74. **Bocagea** *S. Hil.*—4 spp., Trop. S. Amer.; type sp. *B. multiflora,* Amazons.
75. **Hornschuchia** *Nees* (*Mosenodendron* R. E. Fries).—1 sp., *H. Bryotrophe,* Brazil.—See Hallier in Beihefte Bot. Centralb. 13 : 361 (1903).
76. **Alphonsea** *Hk. f. & Thoms.*—20 spp., Indo-Malaya; type sp. *A. lutea* Hk. f. & Thoms., Eastern India.—King, Ann. Bot. Gard. Calcutta 4 : 161.

77. **Canangium** *Baill.* Hist. Pl. 1 : 213 (1868) (incl. *Cananga* Rumph. ex. Hk. f. & Thoms. (1855) not of Aubl. (1775), and *Fitzgeraldia* F. Muell.).—4 spp. Indo-Malaya; type sp. *C. odoratum*, Indo-Mal., often cult.—King, Ann. Bot. Gard. Calcutta 4 : 49.
78. **Platymitra** *Boerl.* Cat. Pl. Phanerog. Hort. Bot. Bog. 1 : 33 (1899).—2 spp.; type sp. *P. macrocarpa*, Java, Sumatra. *P. siamensis*, Siam.
79. **Orophea** *Blume.*—45 spp., Indo-Malaya, New Guinea; type sp. *O. zeylanica*, Ceylon, Malabar.—King, Ann. Bot. Gard. Calcutta 4 : 101.
80. **Disepalum** *Hk. f.*—4 spp., Malaya; type *D. longipes*, Mal. Penins.
81. **Tetrastemma** *Diels* in Engl. Bot. Jahrb. 39 : 475, f. 1 (1907).—1 sp., *T. dioicum*, Cameroons.
82. **Uvariopsis** *Engl.* Notizbl. Bot. Gart. Berl. 2 : 298 (1889).—2 spp., W. Afr.; type sp. *U. Zenkeri*, Cameroons.—Engl. & Diels, Monogr. Afr. Anonac. 38 : t. 15A.
83. **Tridimeris** *Baill.* Adans. 9 : 219 (1869).—1 sp., *T. Hahniana*, Mexico.
84. **Dasymachalon** *Dalla Torre & Harms*, Siphonog. 174 (1901).—8 spp., Indo-Malaya; type sp. *D. Blumei* Finet & Gagnep., Indo-Malaya.—See Merrill in Philipp. Journ. Sci. 10 : 235 (1915).
85. **Petalolophus** *K. Schum. & Lauterb.* Nachtr. H. Deutsch Sudsee, 265 (1905).—1 sp. *P. megalophus*, New Guinea.
86. **Dennettia** *Bak. f.* in Rendl. Cat. Talb. Pl. Nig. 5, f. 2 (1913).—1 sp., *D. tripetala*, S. Nigeria.
87. **Thonnera** *De Wild.* Ann. Mus. Cong. ser. 5, 3 : 36, t. 15 (1909).—1 sp., *T. congolana*, Belgian Congo.
88. **Enantia** *Oliv.* in Journ. Linn. Soc. Bot. 9 : 174 (1867).—3 spp., Trop. Afr.; type sp. *E. chlorantha*, S. Nigeria, Cameroons.—Engl. & Diels, Monogr. Afr. Anonac. 69.
89. **Eburopetalum** *Becc.* Nuov. Giorn. Bot. Ital. 3 : 181 (1871).—1 sp., *E. borneense*, Borneo.
90. **Ararocarpus** *Scheffl.* Ann. Buitenz. Bot. Gart. 2 : 10 (1885).—1 sp. *A. velutinus*, Java.
91. **Anona** *Linn.**—65 spp. Tropics.; type sp. *A. muricata* Linn., widely cult.;—W. E. Safford, Classif. of the genus Anona with descriptions of new and imperfectly known species, in Contrib. Un. St. Nat. Herb. 18 : 1–68, tt. 1–37 (1914).
92. **Raimondia** *Safford*, Contrib. Un. St. Nat. Herb. 16 : 217, pl. 52–3 (1913).—2 spp., S Amer.; type sp. *R. monoica*, Colombia.
93. **Rollinia** *St. Hil.*—35 spp., Cent. and Trop. S. America; type sp. ***R. longifolia***, Brazil.

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* According to Safford (Journ. Wash. Acad. Sci. 1 : 118–120, 1911), this name should be spelled *Annona*, but see also Sprague's note in Journ. Bot. 59 : 158 (1921).

Subfamily II.—**MONODOROIDEAE.**

94. **Isolona** *Engl.* in Engl. & Prantl. Naturl. Pflanzenf. Nachtr. 3, 2 : 161 (1897).—10 spp., Trop. Afr.; Madag.; type sp. *I. madagascariensis*, Madag.—Engl. & Diels, Monogr. Afr. Anonac. 82.

95. **Monodora** *Dun.*—14 spp., Trop. Afr., Madag.; type sp. *M. Myristica*, Sierra Leone to Uganda and Angola (cult. West Ind.).—Engl. & Diels, Monogr. Afr. Anonac. 84.

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# XXII.—THE CITRUS INDUSTRY IN FIJI.

The following paper on the Citrus Industry in Fiji and the possibilities of its extension is a welcome contribution to the series of papers that have appeared in the Kew Bulletin, from time to time, on the various agricultural crops that have been tried as commercial ventures in these islands. The paper has been written by Mr. C. H. Wright, Government Agricultural Chemist, and sometime Acting Superintendent of Agriculture, Fiji, and has been communicated by the Crown Agents for the Colonies.

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The orange is not a native of Fiji; it was introduced into the Colony, according to the "Narrative of the United States Exploring Expedition," Vol. III, p. 335, by Mr. Vanderford in 1823 from Tahiti, where the orange had been introduced from Rio de Janeiro as seed by Captain Cook. The mandarin (a variety of the orange) was a much later introduction into Fiji. This fruit is not mentioned in "A Year in Fiji", 1881, by John Horne, who was in the Colony during the years 1878–9; and the omission is significant, since he devotes a whole chapter to the fruits of Fiji. Enquiries made as to the introduction of the mandarin failed to elicit the country of origin; but all the facts collected pointed to the conclusion that this fruit was introduced into the region of the lower Rewa River in the very early eighties; and an old resident in Fiji remembers first seeing mandarins at Nukumoto (then owned by Hennings Brothers) about 1883.

Orange trees are now found all over Fiji, but these, as well as mandarin trees, are very abundant on the lower Rewa River. They have grown from seed, being mostly self sown; they are generally found in or near Fijian villages, where they are not systematically cultivated; nor do they receive any special care or attention, but are growing in an almost wild state. Yet these citrus trees bear large crops of oranges of very good quality, most of which are of medium size, have a thin skin and contain very few pips; and abundant crops of mandarins, which are above the average size, have a thin loose skin and are of an excellent flavour. These trees do not appear to be affected by any fungoid diseases; they are attacked to a limited extent by mealy bugs

and scale insects, but the worst insect pest to which they are liable is the fruit-fly referred to later. All these facts show that the soil and climate conditions in Fiji are eminently suited for the growth of oranges and mandarins; and give some faint idea of what could be done if these fruits were propagated by budding and grown in orchards with proper cultivation.

Sir Henry S. Berkeley, formerly Chief Justice of Fiji, in a paper entitled "Lime and Orange Cultivation as an Industry", read before the Agricultural and Industrial Association of Fiji in June 1888, advocated the cultivation of limes and oranges in Fiji with a view to their export to New Zealand and Australia. Since that paper was written Australia has developed an orange industry; but now Fiji has direct steamer communication with Canada.

For some time the export of citrus fruits to New Zealand was not possible owing to the certificates required by that Government. Regulation 3 (*b*) of the Regulations made on 20th February 1908 under the provisions of the Orchard and Garden Pests Act 1903 provided that fruit other than grapes imported into New Zealand must be accompanied by a certificate signed by the shipper certifying that "no species of the fruit-fly is known to exist in or within one mile of the orchard where such fruit was grown," and also by a similar certificate signed by an officer of the Department of Agriculture certifying that "no species of fruit-fly is known to exist in or within one mile of the orchard where such fruit is certified by the shipper to have been grown." These certificates could not be given owing to the presence in Fiji of a fruit-fly, *Dacus passiflorae* Frogg., which not only lives on oranges and mandarins, but has also been found on other fruits, including guava, mango, passion-fruit, dawa (*Pometia pinnata* Forst.) and Kavika (*Eugenia malaccensis* L.).

Mr. H. W. Simmonds, F.E.S., at present Acting Government Entomologist, was employed by the Government of Fiji in 1920 on a mission to Tahiti to search for and bring to Fiji parasites of the scale insect (*Aspidiotus destructor* Sign.), which was then a serious pest of coconuts in certain parts of the Colony. In this work Mr. Simmonds was entirely successful, and on his return to Fiji visited Rarotonga and made enquiries as to the methods of exporting fruit from there to New Zealand. The following is an extract from his report on this subject :—

"The worst pest is undoubtedly the fruit-fly, *Dacus rarotongensis*. This insect does not seem to have been present formerly, whilst it has only quite recently spread to Mauke and Mangaia, two other Islands of the group. It is now exceedingly common, living on guava and other wild fruits, and attacking oranges in the season . . .

"The method adopted in Rarotonga so far as export is concerned is to set aside a couple of days for picking about 10 days before the New Zealand steamer is due to sail. The fruit is then stored in sheds until a couple of days before

the boat leaves, when it is repacked, and the attacked fruit, which is easily seen, is discarded. As the fruit is brought to the wharf the fruit inspector selects two or three cases from each load, which are opened, when should he find fly-infected fruit the whole consignment is condemned."

As a result of his enquiries in Rarotonga, Mr. Simmonds unofficially approached the Department of Agriculture in New Zealand to see if something could not be done to enable citrus fruits to be imported there from Fiji. He then suggested that all citrus fruits for export should be stored in fly-proof sheds for 8 to 10 days before shipment and then packed and graded under supervision. This proposal would overcome the difficulty of giving a certificate stating that no fruit-fly occurs within a mile of the orchard where the fruit was grown, and would thus open a new market for citrus fruits grown in Fiji.

The attention of the Government of New Zealand was drawn to the above facts, and as a result that Government in November 1920 made the following suggestions with a view to providing better control of the export of fruit from the Pacific Islands, and the prevention of the shipment of any such fruit affected by fruit-fly or other diseases :—

" (*a*) The Authorities of the Islands to erect at ports of
" shipment suitable sheds, having all openings covered with
" wire gauze."

" (*b*) All fruit for export to be in the above sheds at least
" 5 days before being packed."

" (*c*) No fruit to be exported without going through the
" said sheds."

" (*d*) All fruit to be sorted and packed under Government
" supervision."

" (*e*) All fruit to be accompanied by a certificate stating
" that it had been held for 5 days in the Government sheds
" before being packed, and that in the opinion of the
" Inspector it was free from fruit-fly and other diseases."

It was considered that the above proposals, if given effect to, would obviate the condemnation in New Zealand of fruit infected with fruit-fly, and would be the means of saving a large amount of money lost in connection with freight on fruit that is condemned and would also provide greater security against the introduction of fruit-fly than the existing conditions afforded.

A trial shipment of 344 cases of mandarins and 12 cases of oranges inspected and packed in accordance with the above suggestions was made by s.s. " Tofua " in May 1921. The mandarins on inspection in New Zealand were found to be free from fruit-fly, and were sold at satisfactory prices. The oranges, however, were found to be infected with maggots and were therefore condemned. These oranges were kept in the same fly-proof chamber as the mandarins, and it therefore appears that oranges are more liable to be attacked by fruit-fly than mandarins, probably owing to the

larger quantity of acrid oil contained in the skins of the latter fruit. Two subsequent shipments of mandarins during the same year were condemned owing to the presence of the fruit-fly in them; but it is worthy of note that both these left Fiji late in the season, when citrus fruits are apparently more liable to be attacked by this insect.

In March 1922 another trial shipment, consisting of 10 cases of oranges and 15 cases of mandarins was made by the Department of Agriculture. In this case special precautions were taken to select only sound mature fruit. It was picked at Wainibokasi on 10th March; brought into Suva on the 13th; stacked in a fly-proof chamber on the 14th where it remained for 7 days, and after packing was shipped by the s.s. "Navua" which left Suva on the 22nd. This fruit arrived in Auckland "in excellent condition with the exception of a few mandarins in one case" (extract from broker's report), and was sold at very satisfactory prices. The proceeds of sale were as follows :—

| | £ | *s.* | *d.* |
|---|---|---|---|
| *Oranges* - - - - - - | 8 | 3 | 0 |
| *Mandarins* - - - - - - | 19 | 6 | 0 |
| Total - | £27 | 9 | 0 |
| The expenses of this trial shipment were - | 15 | 0 | 11 |

It will thus be seen that the credit balance was £12 8*s.* 1*d.*; this is very satisfactory, but too much importance should not be attached to the actual amount as the prices realised for some of this fruit, particularly the mandarins, were exceptionally high. The real value of this trial shipment is the fact that it was a demonstration that by carefully selecting the fruit and storing it in a fly-proof chamber for 7 days and then packing, citrus fruits could be landed in New Zealand free from the fruit-fly.

Encouraged by the success of this experiment several other shipments of citrus fruits were made to New Zealand by members of the public; and 70 cases of mandarins previously stored and packed under the conditions described above were sent to Vancouver. Many of the mandarins in this consignment arrived in Canada in a green state; this is rather surprising when it is considered that this fruit was 7 days in a fly-proof chamber and then 16 days on board ship. Unfortunately the green mandarins were not appreciated in Canada, apparently because the public there are accustomed to the tangerines imported from Japan, and the green mandarins from Fiji were regarded by them as unripe. These facts should be taken into consideration in any efforts made to extend the export of citrus fruits to Canada, as they will probably raise the same difficulties that have already been encountered in trying to place West Indian limes on the English market as a substitute for lemons.

# XXIII.—NOTES ON UPPER GUINEA FLACOURTIACEAE.

T. F. Chipp.

*Dasylepis* Oliv. As originally suggested by Oliver in the Journ. Linn. Soc. ix. p. 172, the genus *Pyramidocarpus* showed marked affinity with the Flacourtiaceae. The addition of more recent material from Upper Guinea makes it clear that *P. Blackii* Oliv., hitherto the only species described, must be regarded as a species of *Dasylepis*. The description of *Pyramidocarpus* in Die Nat. Pflanzenfamilien iii. 6. p. 16, is incorrect as regards the absence of scales of the perianth, and the style. Mann's specimen from the River Muni, on which Oliver based the genus *Pyramidocarpus*, shows the scales adnate to the inner perianth segments, and a short simple style with a trifid stigma as described by Oliver. The genus *Dasylepis*, therefore, must be regarded as comprising the following five species :—

*D. racemosa* Oliv. Cameroons.
*D. integra* Warb. Usambara.
*D. leptophylla* Gilg. Usambara.
**D. Blackii** (*Oliv.*) *Chipp.* comb. nov.
*D. brevipedicellata* Chipp.

**Dasylepis brevipedicellata** *Chipp ;* species laminis margine toto denticulato-serratis, pedicellis brevibus, floribus confertis ovariis glabris, distincta.

*Arbor* (?) ramulis glabris. *Folia* glabra, coriacea, oblonga basi subcuneata, apice rotundata apiculata vel obtusa acuminata, margine distanter denticulato-serrata, 15–18 cm. longa, 6–7 cm. lata; nervi laterales subtus prominentes, utrinsecus 5–7; petioli circiter 1 cm. longi, infra laminas articulati. *Flores* in racemos spiciformes conferti; racemi apice ramorum in foliorum axilis collecti; rachis glabra, usque ad 5 cm. longa; pedicelli 2 mm. longi. *Perianthia* ciliolata, circiter 9, exteriora 7 mm. longa, 5 mm. lata, interiora 7 mm. longa, 3 mm. lata; squamae dense pilosae dimidiae parti aequantes perianthio interiori adnatae. *Stamina* numerosa, filamenta 5 mm. longa; thecae 3 mm. longae. *Ovarium* glabrum; stylus apice 2–3–4-divisus.

Tropical Africa. Gold Coast; Ashanti, Mim, *Thompson* 52.

*Scottellia* Oliv. From description and examination of foliage *S. macropus* Gilg. & Dinkl. from Liberia appears to be the same as *S. leonensis* Oliv. and should be regarded as a synonym.

**Scottellia Chevalieri** *Chipp ;* affinis *S. kamerunensis* Gilg., sed laminis margine toto serratis subtus dense glandulosis, petiolis longioribus, sepalis non valde nervosis, squamis basi petalorum ad setas fere reductis, differt.

*Arbor* ramulis junioribus teretibus glabris. *Folia* subcoriacea, ovato-oblonga, basi cuneata vel subrotundata, apice rotundata late acuminata, margine toto inaequaliter serrata, subtus dense glandulosa, 8–11 cm. longa, 4·5–6·5 cm. lata; nervi laterales

utrinsecus 6–9; petioli 1–1·5 cm. longi. *Flores* in racemos spiciformes multifloros valde densifloros dispositi, pedicellis tenuibus; racemi in apice ramorum vel in foliorum axillis collecti; bracteae ovatae, mox deciduae, 1–2 mm. longae; bracteolae minutissimae, dense pilosae; rachis minutissime pilosa. *Sepala* rotundata, ciliolata, 2 mm. longa. *Petala* (matura non visa) apice parce pilosa, squamis minutis basi petalorum ad setas fere reductis. *Stamina* 5. *Ovarium* apice in stylum brevem crassum in ramos 3 divisum.

Tropical Africa. Ivory Coast; Vallée de l'Agineby, Kapiécrou, *Chevalier* 16182, 16182 bis.

*Camptostylus* Gilg. As suggested by Gilg (Engl. Bot. Jahrb. 40 : 451) Mann's specimen No. 1196 from the Cameroons described by Oliver (Flor. Trop. Afr. 1 : 118) as *Oncoba ovalis* must be referred to this genus and becomes *Camptostylus ovalis* Chipp, comb. nov. *C. caudatus* Gilg. from the same locality must be regarded as a synonym.

*Caloncoba* Gilg.

**C. ficifolia** *Chipp*, comb. nov. *Oncoba ficifolia* Gilg.

*Flacourtia* Commers.

In view of the considerable difficulty experienced in defining the species described, it appears better to regard the Upper Guinea material generally as belonging to *F. flavescens* Wild., and a second species *F. Vogelii* Hook. f. comprising the Nigerian material with markedly fine parallel veins in the leaves. *F. Ramontchi* L'Herit., was based on a Madagascar plant.

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# XXIV.—PITA AND SILK GRASS.

C. H. Wright.

A considerable amount of public attention has recently been directed to the fibre-yielding plants of Central and South America, and from enquiries received it has been evident that a good deal of misunderstanding prevails in respect of the vernacular name "Pita," and its compounds Pita de Colombia, Pita del Opon and Pita floja. The term Pita, which is found in early botanical works dealing with that part of the world, is a Spanish word applied generally to fibre-yielding plants of the nature of the *Agave*, and even to the prepared fibre itself. Its local application has been extremely wide, and has embraced *Ananas sativus* Schult, (1)(3) and many fibre-yielding members of the family *Bromeliaceae*, and also many species of *Agave*.(2)(3)(4) In some

(1) Mart. Fl. Bras III. iii. 290 (1892).
(2) Corres, Flora de Colombia, p. 256 (1897).
(3) Kew Bulletin, Add. Ser. XI., General Index.
(4) J. R. Drummond and D. Prain. The Agricultural Ledger, Calcutta,

more restricted areas, such as British Honduras, the name "Silk Grass" appears to be more commonly used than "Pita," but this apparently also has an equally wide application, and is used more in respect to the fibre than to any particular kind of plant which produces it.

Mr. M. T. Dawe(1) has recently raised the question as to the identification of the Colombian plants, from which Pita fibre is obtained. The material supplied to Kew was without flowers and consequently could not be definitely determined, but so far as could be ascertained these specimens seemed to support the view that the Colombian Pita plant is *Ananas macrodontes* E. Morr.

Further specimens of a plant known as Pita have been received through the courtesy of Mr. C. E. Dixon, who forwarded to Kew a few flowers and one bracteole collected from the Pita groves in the Chiriguana district of Colombia. These show that the plant is a species of *Bromelia* and is identical with *Aechmea Magdalenae* André (*Chevalliera Magdalenae* André), of which only leaves and young fruit were previously known, and of which a specimen at Kew collected at Balao, Colombia, by Eggers, in January, 1892, quite agrees with Dawe's photograph of the Pita fruit, and is accompanied by leaves 10 ft. long and 4 inches wide. Mez in his monograph of the *Bromeliaceae*, p. 284, notes this species as "*Pita Ecuadorensibus* (ex Eggers)."

André admits in a note in his Bromeliaceae Andreanae that his specimens, which have not been found at Kew, may have been mixed so far as leaves and flowers are concerned, and the leaves he figures on his plate 3 do not seem to agree with those received from Eggers in having more numerous and less robust prickles. Mr. Dawe (Tropical Life, 1920, p. 182) describes the flowers as blue, while Mr. Dixon in his letter describes them as light yellow. In other respects Mr. Dawe's description agrees with that of *Aechmea Magdalenae*, which must now be called *Bromelia Magdalenae*, the flowers of which are described below.

**Bromelia Magdalenae** *C. H. Wright.* *Aechmea Magdalenae* André, Bromel. Andreanae, p. 7; Baker, Handb. Bromel, p. 65 Mez, Monogr. Bromel, p. 284. *Chevalliera Magdalenae* André, Enum. Bromel., p. 3, and Bromel. Andreanae, p. 7, t. 3 (excl. leaf ?). *Sepala* triangularia, longe acuminata, asymmetrica, arcte carinata, induplicata, sublignosa alis coriaceis, dense lepidota, 4 cm. longa, 1·2 cm. lata. *Petala* basi leviter connata, oblonga, acuminata, eligulata, pallide lutea (fide *Dixon*). *Stamina* prope basin petalorum inserta; filamenta 1·3 cm. longa, complanata; antherae prope basin dorsifixae, 1·1 cm. longae, acutae, sagittatae; pollinis granula subglobosa, eporosa, membrana crassa instructa. *Ovarium* breviter triangulare, stylus staminibus aequilongus; rami 6 mm. longi, membranaceo-alati.

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(1) Tropical Life, Dec. 1920, Jan. 1921, May 1922.

# XXV.—MISCELLANEOUS NOTES.

Mr. G. Dear.—In December last Mr. G. Dear retired under the age limit, after a service of upwards of thirty-eight years at Kew. Mr. Dear entered Kew on July 7th, 1884, and after serving successively as a gardener and as Seed Collector, he was appointed Storekeeper on the 1st May, 1893. The duties of Storekeeper occupied only a portion of Mr. Dear's time, the remainder being spent in clerical work in the Curator's office. The conscientious manner in which Mr. Dear discharged his duties as Storekeeper is known to many generations of Kew men, while his work in the Curator's office was invariably marked by accuracy and good judgment.

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**Fruit Cultivation in Trinidad and Tobago.***—One of the chief difficulties experienced in the tropics is the supply of fresh fruit and vegetables. Although many tropical stations have now been established for several decades it is astonishing to find that the cultivation, improvement and introduction of fruits has received such scant attention that in many tropical Colonies it is difficult to obtain even bananas and pawpaws at certain times of the year. That market gardening in the tropics is hardly a sufficiently important commercial industry to attract the Europeans is partly the reason of its neglect, but the increasing demand for fruit in the evergrowing centres of population makes it almost imperative for local authorities to begin to take an active interest in its supply. The attempt of the Trinidad Agricultural Society to arouse the interest of the small holder has resulted in the publication of a treatise on the cultivation of the principal fruits suitable to the country, the general treatment, diseases and working costs being given with each crop. More than that, however, the Preface states the practical steps being taken to interest individuals in the venture. This consists not only in selling good stock at a low price but in assuring a market to the planter.

"It is felt that the immediate market can be obtained by developing a local trade on similar lines to that which has been developed during the last five years in 'ground provisions' (yams, sweet potatoes, tannias, corn, peas, &c.). Prior to 1917 there was little inducement for anyone to grow ground provisions, unless he was prepared to sell in the local markets, which usually meant sending someone personally to dispose of the produce. The opening of the Government Ground Provisions Depôt in Port-of-Spain, and subsequently one in Tobago, has changed that, and produce can be consigned by rail or steamer and full cash value received by return. The business has grown from one of £1,615 receipts in the first twelve months to over £12,000 in 1921. The Department of Agriculture is opening early in

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* Fruit Cultivation in Trinidad and Tobago. The Agricultural Society of Trinidad, Nov. 1922, pp. 91. 17 plates and figs. 1*s*.

1923 a Fruit Shop in Frederick Street, Port-of-Spain, to be run on similar lines to its Ground Provisions Depôt, and it is confidently hoped that this will enable those who have only a few trees, to dispose of any good produce to advantage. This will encourage planting, and lead to there being greater supplies of fruit than are wanted for local consumption.

"The next step should be supplying ships calling at Trinidad, and also exporting to Barbados and Bermuda where a former Fruit Committee of the Society ascertained there was a demand for our fruit.

"With a still larger production, and the experience gained meanwhile, we should be able to place our fruit successfully on more distant markets, *e.g.*, the United Kingdom and Canada, which with our limited supply is practically impossible at present excepting in casual consignments. There need not be long intervals between the first steps—the local trade, supplying ships, and exporting to Barbados and Bermuda, as when once a start is made on definite lines it is probable that the existing supplies will prove greater than is at present realised."

The example of Trinidad in this direction can be commended to those tropical Colonies where a lack of fresh fruit and vegetables is constituting a serious menace to the health of the town populations.

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**Menzies' Journal of Vancouver's Voyage.***—The name of Archibald Menzies, a Scottish gardener who forsook gardening to study botany and medicine, and during the latter years of the eighteenth century became an eminent explorer and traveller, is well known to horticulturists by reason of his introductions of trees and other hardy plants from Western North America, a region at that time new to European travellers. Born in 1754 at Stix near Aberfeldy in Perthshire, he was educated at Weem Parish School and began his gardening career in the famous gardens at Castle Menzies. He afterwards entered the Royal Botanic Gardens, Edinburgh, as a student, where he commenced working for a medical degree. In 1782 he was acting as assistant surgeon in the Royal Navy and saw active service in Rodney's victory over the Comte de Grasse. During the next few years he took part in several long voyages of exploration and in 1790 the British Government appointed him as naturalist to accompany Captain Vancouver in the "Discovery" on a voyage round the world. The voyage extended from 1790 to 1795, and Menzies' duties were "to investigate the whole of the natural history of the countries visited, paying attention to the nature of the soil, and in view of the prospect of sending out settlers from England, whether grains, fruits, etc., cultivated in Europe are likely to thrive. All trees, shrubs, plants, grasses, ferns,

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* Menzies' Journal of Vancouver's Voyage, April to October 1792. Edited by C. F. Newcombe, M.D. Publication of the Provincial Library and Archives Department of British Columbia, $5·00.

and mosses were to be enumerated by their scientific names as well as those used in the language of the natives. He was to dry specimens of all that were worthy of being brought home and all that could be procured, either living plants or seeds, so that their names and qualities could be ascertained at His Majesty's gardens at Kew. Any curious or valuable plants that could not be propagated from seeds were to be dug up and planted in the glass frame provided for the purpose." The present work deals with the portion of Menzies' journal covering the period April to October 1792, whilst the expedition coasted Western North America from latitude 35° 25′ north, off Northern California, to latitude 52° 18′, where the survey for the season ended at Port Menzies in Burke Channel, and it forms Memoir No. V. of the Archives of British Columbia, under the editorship of Dr. C. F. Newcombe. The extracts from the journal chiefly deal with boat journeys conducted amongst the numerous islands, bays and straits for the purpose of surveying the coast-line, and from a botanical point of view they are disappointing. Land journeys appear to have been limited in number and extent, and the collection of plants must have been carried on under great difficulties. Nevertheless there are numerous references to interesting plants being planted in the glazed frame on the quarter deck of Captain Vancouver's ship, and the foundation was laid for the subsequent highly successful exploration of the forest flora of Western North America by David Douglas. The pages contain a great deal of interesting information concerning the physical, ethnological, zoological and general botanical characteristics of the region, although we should have expected to have heard more of the impression created by the wonderful vegetation of what was practically a new country. Nearly 300 forms of plant life were collected, which included flowering plants, ferns, mosses, lichens, and marine algae. Dr. Newcombe has presented his work in an attractive manner, while an introductory biographical note by Mr. J. Forsyth is full of interest.

W. D.

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**The Destructive Distillation of Wood.***—The destructive distillation of wood is an increasingly important factor in the economic working of forest areas and timber yards, for by this means it is now possible to turn to good account material that was at one time wasted. The demand for methyl alcohol alone suggests that wood distillation will occupy an even more important position in the future than at present, whereas the uses for acetic acid, charcoal, tar, tar oils, resin, turpentines, and other products are constant. Thus the appearance of an exhaustive treatise upon the subject is very gratifying, and particularly so when produced by a man of such wide understanding as Mr. Bunbury.

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* H. M. Bunbury. The Destructive Distillation of Wood. Benn Brothers, Limited, London, 1923. Price 35*s*. net.

The work begins with a historical chapter on the development of the wood distillation industry and is followed by chapters on the trees used for the purpose; the chemistry of wood; factors influencing the thermal decomposition of wood; the crude products of distillation; the thermal decomposition reactions; wood distillation on a commercial scale; the factory; wood distillation plant and operations; the production of charcoal and crude pyroligneous acid; the production of dilute calcium acetate solution and wood alcohol; the production of dry calcium acetate, refined wood alcohol, pure methyl alcohol, refined wood turpentine and pine oils; the production of wood tar, wood oils, and wood pitch; the destructive distillation of small wood and wood waste; the production of illuminating and power gas from wood; analytical methods; statistics. It will thus be seen that the work is thoroughly comprehensive, whilst its value is increased by upwards of 100 excellent illustrations of plants, etc., and 115 tables which clearly indicate the results of various experiments. Whilst the book is primarily one for the manufacturing chemist it will also be found of considerable value to foresters and wood-workers, particularly those parts that refer to waste wood, and it is likely that it will become a standard work for forest students. Although published in England there is much in the book that is applicable to other countries, especially to Canada and the United States, as many of the tables deal with North American woods the products of which may easily be compared with allied European species.

W. D.

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**Dates and Date Cultivation of the Iraq.***—Parts I and II of this work were reviewed in the Bulletin for 1922, pp. 156–158. The present issue, Part III, deals mainly with the varieties of Date Palms of the Shatt Al 'Arab. A descriptive list of 48 varieties of female palms is given and a note is added on the male palms of the region, of which the number reported is insignificant in comparison with those of the female. "The common male palm of the whole Shatt Al 'Arab region is the "Khikri," a rankly growing vigorous palm, easily distinguishable from surrounding females by its greater height, greater girth, larger number of fronds and more numerous and bigger spines." Included in the work are notes on the "Distribution of Date Palms," "Date Varieties and their Classification," lists of the Varieties of Date Palms of the World, covering Morocco, Algeria, Tunisia, Tripoli, Egypt, Sudan, Cyprus, Arabia, Persia, India, United States of America and Australia. The work is well illustrated and contains an extensive bibliography.

J. H. H.

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* V. H. W. Dowson. Dates and Date Cultivation of the Iraq. Part III. W. Heffer & Sons, Ltd., Cambridge, 1923: pp. 97, price 10*s*.

**Botanists in Germany and Austria.***—The library has received through Dr. Stapf a pamphlet the purpose of which is to give the names of botanists at the numerous scientific institutions in Germany and Austria. In view of the fact that the latest edition of Dörfler's "Botaniker-Adressbuch" was issued in 1909, and is therefore out-of-date, the need of Prof. Janchen's list has been much felt. It supplies first the names of the institutions in Germany, arranged under towns. Separate lists are given for Austria and for German institutions in Czecho Slovakia. These are followed by an index to the institutions arranged under subjects, and finally an index to personal names is provided.

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**Siamese Plant Names.**†—Under the direction of the Chief Conservator of Forests, Siam, a list of the vernacular names of trees, shrubs, etc., with their botanical equivalents has recently been compiled and published. The vernacular names are given in Siamese and roman characters and are arranged under Siamese letters as explained on the contents page. The work is intended for forest officers, timber merchants and students and should prove of much use locally, but without an alphabetical index in roman characters it loses much of its value to workers unacquainted with Siamese.

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* Die in Deutschland und Österreich an wissenschaftlichen Anstalten wirkenden Botaniker. Unter Mitwirkung zahlreicher Fachgenossen zusammengestellt von Erwin Janchen. Wien und Leipzig: Druck und Verlag von Carl Gerold's Sohn, 1923. 8vo. Pp. 32.

† Phya Vanpruck Picharn. List of Common Trees, Shrubs, etc., in Siam. Bangkok Times Press, 1923, pp. 278.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8] [1923

# XXVI.—THE CAUSATIVE ORGANISM OF SKIN SPOT OF POTATOES.

W. A. MILLARD and SYDNEY BURR.

Since the first description of Skin Spot in scientific literature there has been considerable discussion as to the identity of the causative organism of this disease. The most complete study of the disease is that of Owen(7) (1919) from whose paper the following brief historical summary is taken :—

In 1904, Carruthers(1), describing the Skin spot pustules as "bluish black warts", isolated a fungus from which he was unable to obtain any fructifications whereby it could be identified.

In 1915, Pethybridge(8) suggested *Spicaria solani* as the causative agent, whilst Milburn & Bessey(5) attributed a disease apparently identical with Skin spot to *Spicaria nivea*. Lastly, Güssow(2) (1918) stated the opinion that the disease was of physiological and not microbic origin.

The result of Miss Owen's investigation was to give the causative organism as a new species which was named *Oospora pustulans* Owen & Wakef., and, with the publication of this work, the discussion was generally supposed to be ended. This has not been the case, however, in America or Germany. In 1920, Wollenweber(11), who does not appear to be acquainted with the English work on the subject, published an account of "Die Pustelfäule" which, from his description and illustration, is obviously the same as Skin spot. He attributes this disease to *Phoma eupyrena* and finds a similarity between it and the "Dry Rot associated with Powdery Scab" described in 1916 by Melhus, Rosenbaum and Schultz(4) and ascribed by them to *Phoma tuberosa*. The last contribution to the discussion is that of Shapovalov(10) (1923) who makes the startling announcement that Skin spot, as such, does not exist, but that the pustules of the disease are a primary stage of Corky Scab (*Spongospora subterranea*). The importance of such a statement is only realised when we remember how very common the pustules of the disease have become of recent years on the seed potatoes of many of our best-known varieties.

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A preliminary account of the hypotheses upon which this remarkable theory was based was communicated by Dr. Shapovalov to Mr. A. D. Cotton in March 1922. The correspondence was very kindly forwarded by Mr. Cotton and, at Dr. Shapovalov's suggestion, we started to investigate the theory. We did not know that Dr. Shapovalov had carried out any direct experimental work of his own on the subject beyond the preliminary examination of a number of pustules, and we were, therefore, very surprised to learn from his paper that, no doubt as the outcome of this work, his theory had crystallised into a statement of proven fact. We venture to quote three paragraphs which show how very definite are the conclusions at which he has arrived.

(1) "Neither *Oospora pustulans* nor any other filamentous fungus or environmental conditions mentioned by previous authors in connection with Skin spot are proved to be the primary cause of the disease."

(2) "The fungi associated with the spots in question are mainly secondary invaders developing during the storage period."

(3) ". . . Skin spot pustules are essentially and primarily the closed or immature sori of powdery scab."

Before describing our own experiments, we wish briefly to discuss the salient points of evidence upon which these conclusions are based.

Shapovalov([10]) calls attention to the variety of organisms which have been isolated and given causative rank by different investigators. These have already been noted, but the author swells the number by including O'Brien's work on Rhizoctonia Scab (*Rhizoctonia crocorum*)([6]). In addition he himself has found the predominant organism in pustules stated to be Skin spot to be *Colletotrichum atramentarium*. In no case does he regard the causative nature of any of these organisms to have been proven by inoculation experiments, and, in view of these facts, he forms the opinion that such organisms are accidental or secondary invaders of the pustules—the particular species found in any place being dependent on climatic or environmental conditions. In this connection he notes the prevalence of *O. pustulans* in English material as compared with *Colletotrichum atramentarium* in American. A little unbiassed examination of this argument will show that it lacks the support of substantiated facts. It is only too easy to name plant diseases which have passed under a category of misnomers before receiving their legitimate baptism. In the present instance neither Pethybridge([8]) nor Milburn & Bessey([5]) claim to have established the pathogenicity of the organisms they isolated.

Again, the work of Melhus, Rosenbaum & Schultz([4]) shows very clearly that the Dry Rot which they found associated with Corky Scab produces lesions which are quite distinctive and unlike Skin spot pustules. In fact, in the colored plate referred

# Plate III.

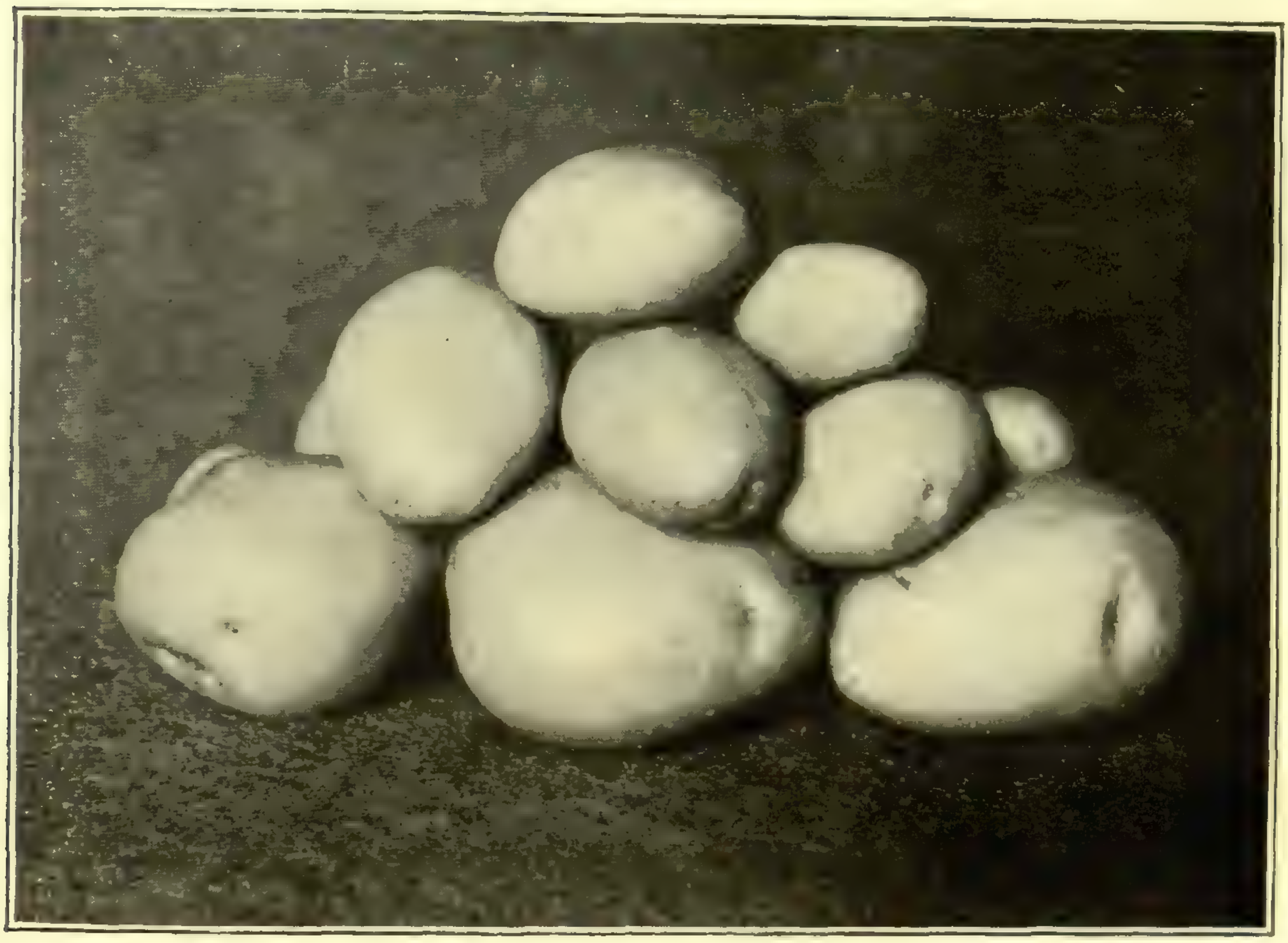

Fig. 1.

Fig. 2.

Fig. 1. The produce of one pot of potatoes inoculated with *Oospora pustulans* as they appeared on lifting.

Fig. 2. The produce of one pot of potatoes inoculated with *Oospora pustulans* and *Spongospora subterranea* as they appeared on lifting.

[*To face page 274*

PLATE IV.

Fig. 3.

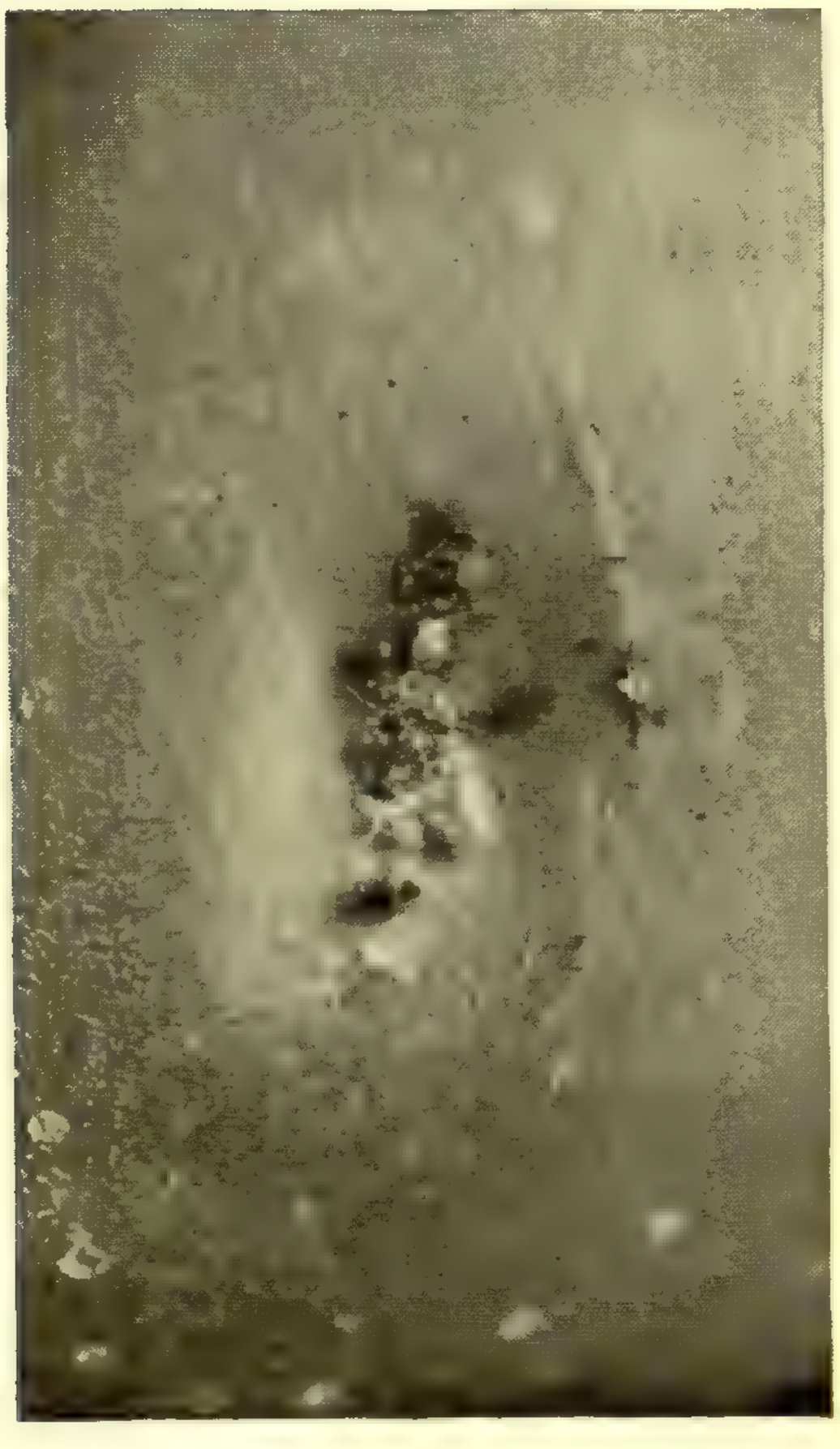

Fig. 4.

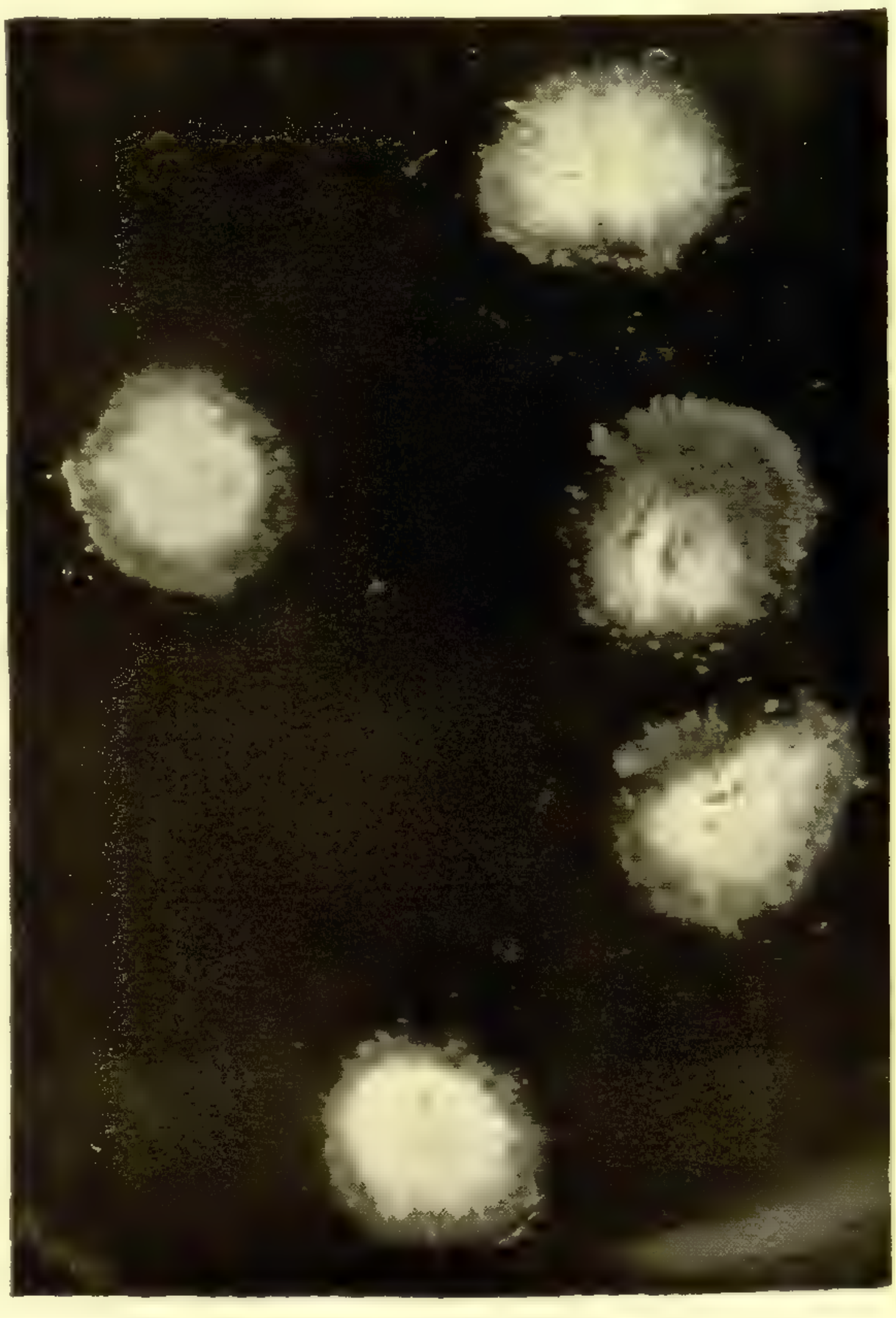

Fig. 5.

Fig. 3. Two tubers from one of the pots inoculated with *Oospora pustulans* showing Skin spot pustules which developed during storage.

Fig. 4. An eye of one of the infected tubers.

Fig. 5. Large colonies of *O. pustulans* developed from sections of Skin spot pustules planted on Nutrient Potato Agar.

*To face page* 275]

to by Shapovalov, the only figures (Nos. 1 and 6), in which the pustules show any resemblance whatever to Skin spot, are of tubers from which *Phoma tuberosa* was *not* isolated by these writers. The present writers are familiar with Phoma Dry Rot accompanying Corky Scab on stored potatoes, but fail to understand how this could possibly be mistaken for Skin spot.

Wollenweber's(11) work on *Phoma eupyrena* is very unconvincing and his attempt to bring his work into line with that of Melhus, Rosenbaum & Schultz(4) weakens his case so much as to make it negligible in any serious consideration of the disease. In the reference to Rhizoctonia Scab, a similarity is found between Skin spot and Plate v of O'Brien's (6)paper, but apparently this is an error, and Plate vii is that meant. The truth of this comparison is admitted, but, on the other hand, the inclusion of this photograph by O'Brien as a specimen of Rhizoctonia Scab seems to be based on general observation rather than on experimental fact, and the only reference to it in the text is entirely descriptive. On this account, it cannot be properly used in any critical survey of the literature.

The only previous work, therefore, which is relevant to the discussion is that of Owen(7), and the only organism which is at all authenticated as causative of Skin spot is *Oospora pustulans*. We must admit, however, that the inoculation experiments carried out by Miss Owen were inconclusive and, to this extent, Shapovalov's criticism is justifiable.

Turning now to Shapovalov's own experimental work we see that the main results are as follows :—

(1) The predominant organism found in the pustules of a batch of potatoes from Pennsylvania was *Colletotrichum atramentarium*. Other Fungi and Bacteria were also isolated but *Oospora pustulans* was not found at all. The latter organism is stated to be rare or entirely absent in Skin spot material grown in America.

(2) A similarity was observed in the appearance of Skin spot pustules and the primary or "Halo" stage of Corky Scab described by Kunkel.(3) Furthermore, sections of Skin spot pustules were thought to reveal the same structure and characteristics as Kunkel describes in this "Halo" stage of Corky Scab.

(3) Inoculation experiments carried out with cultures of *O. pustulans* failed to reproduce Skin spot.

With regard to the first of these points, it is unfortunate that no photograph of the potatoes from which the isolations were made is given. Although we are not acquainted with the particular species of *Colletotrichum* mentioned, we were of the opinion that members of this genus commonly produced minute, dark-coloured, erumpent acervuli easily seen with the naked eye on the surface of their host plant. On these acervuli are borne the conidia and certain spine-like setae typical of the genus. We have certainly never seen anything of the kind on a Skin spot pustule.

The second point is of greater importance, and Shapovalov here refers to Kunkel's(3) plates XXXIX, XLI, and XLII in support of his statement. Plate XXXIX figures a section through a very young sorus of Corky Scab. The sub-peridermal cells below the raised part of the sorus are comparatively free from plasmodial infection, but lower in the tissues the infecting plasmodium is clearly shown pushing its way between the cells. Plates XLI and XLII are micro-photographs of the same area in which the "spaces previously occupied by the infecting plasmodium" show as dark intercellular spaces. Shapovalov lays great stress on this peculiarity in the progress of the path of infection, and finds an analogy between it and a similar phenomenon in a Skin spot pustule. He gives a diagrammatic sketch of the latter in Fig. I of his paper and carries the analogy further by omitting any layer of cork below the infected tissue, although admitting that this sometimes occurs. We could easily have accepted this figure for a primary stage of Corky Scab, but find it altogether misleading as a representation of Skin spot. A description of the latter is, however, left to a later part of this paper. We pass to what is obviously the only real test of similarity between the two diseases, namely, the presence or absence of the plasmodium of *Spongospora subterranea*. In all Kunkel's plates the plasmodium, although it may have forsaken the upper layers of parenchymatous cells, is clearly present in the deeper tissues. It is not clear whether Shapovalov claims to have found such plasmodia in Skin spot pustules or not. He speaks of the "path of infection" and of "infection" which extends into the cells, but what this really means it is impossible to say. We can only conclude that no definite plasmodia have been found in the pustules and that, consequently, the case for analogy between the two diseases is unproven.

The last of the links in the author's chain of evidence consists of his failure to reproduce Skin spot with cultures of *Oospora pustulans*. He gives no account of his inoculation experiments, but disposes of them in the sentence "The writer's laboratory inoculation of healthy potato tubers with *O. pustulans*, like those reported by Owen(7), gave entirely negative results." No pot or field experiments appear to have been carried out, and in view of the fact that Miss Owen certainly obtained strong indications of pathogenicity in her field experiments, this summary dismissal of the organism is very premature. Had more positive results been obtained in the search for plasmodia in the pustules, then these negative results with *Oospora* would certainly have lent strong support to the theory. As it is, they leave us where we were. We hope that the vexed question may now be finally settled by the experiments which we have carried out during the last year, and which we describe below.

## Account of Experimental Work.

Isolation of *Oospora pustulans*. Some typical Skin spot material from King Edward and Ally seed potatoes was easily

obtained in the spring of 1922. The tubers were well washed, dried, and sterilised in alcohol. Thin sections from a pustule were then taken from well below the surface and plated on Nutrient Potato Agar (pH @ 6·6) in Petri dishes. Very little bacterial contamination occurred, but fungus threads, apparently belonging to the same species, grew out in all directions from the sections. After plating a number of pustules from different tubers in this way, plates were obtained showing nothing but the fungus, and from these several pure cultures were made. The latter precaution was taken since it was thought, in spite of apparent similarity, that different species of fungi might be present. The cultures made, however, eventually turned out to be the same. We had not seen *O. pustulans* in culture before and Owen's(7) account of the fungus was not to hand at the time. From our own cultures, however, we made single spore cultures in hanging drops of media by means of which we were able to trace the development of the species from the germination of the spore to the full development of the conidiophores and spore chains. Careful drawings were made throughout, and a comparison later with Owen's(7) figures and description left no doubt whatever in our minds that we were dealing with *O. pustulans*. We were, moreover, interested to find that we had passed through the same difficulties in the choice of the most suitable media and of the optimum temperature for growth of the fungus which Miss Owen describes. All the cultures subsequently used for inoculation purposes were grown on potato plug.

Inoculation experiments.

It has already been stated in the introduction to this paper that we were aware of the hypothesis which Shapovalov(10) had tentatively advanced to account for Skin spot. We considered the idea with an open mind, and our experiments were designed to test it as far as possible. At the same time, we were much impressed by the abundance of the fungus in the skin spot pustules, and found it very difficult to suppose that this was but a secondary organism. We thought it possible, however, that a double infection of *Spongospora* and of *Oospora* might occur, and that, supposing an antagonism existed between these two, such as is well known to exist between certain species of Bacteria, this might account for the non-development of the plasmodium of *Spongospora*, and perhaps also for the subsequent death of the filaments of *Oospora* as recorded by Owen(7). This hypothesis was, no doubt, even more hypothetical than Shapavalov's, but, at the same time, it appeared to us feasible and more in accord with the fact that the general appearance of Skin spot was so essentially different from Corky Scab. The following series of inoculations were, therefore, planned with these duplicate hypotheses in mind.

Series 1. Inoculation with *O. pustulans only*.
,, 2. ,, ,, Corky Scab only.
,, 3. ,, ,, *O. pustulans* and Corky Scab.
,, 4. Control.

The object of Series 1 is obvious. From Series 2 we expected to be able to observe Corky Scab in all its stages, whilst in Series 3 there would be every opportunity for the dual invasion of the tubers. Should, therefore, the inoculation in Series 1 fail to produce Skin spot, a comparison of results from Series 2 and 3 might give us a solution to the problem. The first three series each consisted of four 14-inch pots, and the control series of two similar pots. The pots were scrubbed with strong Formalin solution, put under a tap of superheated steam, and finally placed in a greenhouse which had been thoroughly sterilised with Formalin.

The soil, a light loam off limestone, and apparently poor in humus, was autoclaved at 130° C. for 1 hour.

The potato sets, "King Edward," were sterilised in $\frac{1}{4}$ per cent. Formaldehyde solution for 3 hours, and, after sprouting in the greenhouse, one set was planted in each pot. When the plants were 6 inches high the inoculations were made in the following manner.

*Series* 1. Six potato plug cultures were carefully shaken into a dish of sterile soil. The plugs were then cut up with a sterile knife and mixed with the soil. This infected soil was carefully spread around the base of one plant and the whole pot was then covered to a depth of an inch or more with sterile soil for which space had been left. Each of the four pots was given a similar inoculation, since previous experience had shown us that, in pot inoculations, the conditions are generally unsuitable for the development and penetration of aerobic organisms and heavy infections such as those described are advisable.

*Series* 2. The Corky Scab inoculum was prepared by scraping out the spore balls from the open sori of a large number of scabbed potatoes. These potatoes were a part of a crop from some experiments on Corky Scab made the previous year. They had been washed and dried before being stored, and, consequently, the sori were relatively free from dirt. Obviously, however, some soil particles would be introduced with the inoculum and spores of other organisms (including possibly *O. pustulans*) would be present in it. The number of such spores would, however, be infinitesimally small compared with the masses introduced with the cultures in the other series.

*Series* 3. Here, each pot was given an infection of *O. pustulans* and Corky Scab each equal in amount to that given in the previous series.

*Series* 4. A quantity of sterile soil was added to each of the pots as in the other series, and it may be pointed out that this plan, forming as it does an analogy to "earthing up" in the field, is extremely useful in pot work in securing a good crop.

All the pots were given a dressing of sterilised artificial manure, which was applied at the time the potatoes were planted. In order to ascertain whether wet or dry conditions of the soil might exert any influence on the infection produced, two of the

pots in each series were mulched with a layer of sterile grass to keep the soil constantly damp. So long as the pots remained in the greenhouse the floor of the house and the gravel into which the drainage water of the pots ran was regularly watered with a strong solution of potassium permanganate as a precaution against cross infection between the pots. Later, it was found difficult to keep the temperature of the house below 25° C., and as, in the laboratory, this temperature had been found prejudicial to the growth of *Oospora*, the pots were taken from the house and placed in groups of their respective series at one end of the lawn. All the plants made good growth and remained healthy throughout the season, and we were thus fortunate in having no complicatory diseases to consider in the final results. The above experimental details have been given thus fully in order to show that the conditions of the experiment were as stringent as it was possible to make them.

Results of Inoculations.

The potatoes were lifted in October, when the same precautions against accidental or cross infection were observed as on planting. Each pot gave an approximate yield of $1\frac{1}{2}$ lbs.—a serviceable quantity to deal with. The soil was dry, and the potatoes from each pot were placed directly on lifting into a new brown paper bag which was at once closed, but which admitted a free supply of air. The bags were then stored in an unheated room during the winter, with the exception of one bag from each series which was opened and the potatoes washed and examined. These are described below, and photographs of the crops from Series 1 and 3 are given in Figs. 1 and 2.

*Series* 1. *Oospora* inoculation. Tubers absolutely clean and indistinguishable from those of the Control pot (*see* Fig. 1).

*Series* 2. Corky Scab inoculation. Every tuber infected with the typical sori of Corky Scab in all stages. None of these bore any resemblance to Skin spot pustules.

*Series* 3. *Oospora* and Corky Scab inoculation. No Skin spot pustules were seen, but the potatoes were covered with sori of Corky Scab varying in diameter from 0·5 to 10 mms. Most of the sori were unbroken and many were as small or smaller than Skin spot pustules, but none could have been confused with the latter. (*See* Fig. 2).

*Series* 4. Control. Every tuber was perfectly clean and free from blemish.

Each group of photographed potatoes was placed in a clean bag and stored in the same place as the remaining crops.

We had been prepared to some extent by Owen's(7) work for the fact that Skin spot was essentially a storage disease, but, in spite of this, we must confess that at this stage we had little expectation of seeing any spot or blemish appear on the smooth and glossy skins of the *Oospora*-infected tubers. In April of this year, however, all the bags were opened and we were

astonished to find abundant Skin spot pustules throughout Series 1. The details of inspection of the whole of the series are given below, the pot which had been examined at harvest time and from which the photographs had been made being marked D in each series.

Results (after storage of the potatoes).

*Series* 1. *Oospora* inoculation.

| Pot. | No. of Tubers per pot. | No. of tubers per pot showing typical Skin spot pustules. |
|---|---|---|
| A. | 15 | 11 |
| B. | 13 | 6 |
| C. | 20 | 0 |
| D. | 16 | 7 |

The degree of infection on any one tuber naturally varied very much. Some showed 2 or 3 pustules only, but generally the infection was much greater, and on one tuber there were as many as 80 pustules. A feature of the infection was that in the great majority of cases, the pustules appeared mainly round and about the eyes of the tubers. The shoots from such eyes were markedly fewer and weak in growth, and in a few instances, the eye was killed outright.

This fact is of interest since it indicates that the eye of the tuber is the most susceptible spot to *Oospora* attack, and is in contra-distinction to the s atement of Melhus, Rosenbaum & Schultz(4), that, in Corky Scab, " the earliest infections on the tuber usually occur about the stem end " and that, in one of their experiments " 90 per cent. of the pustules on the infected tubers were about the stem ends rather than the eye ends." This eye infection with *O. pustulans* is also confirmatory of the observations of previous English workers on the injury caused to potato eyes by Skin spot disease. A photograph of two of the infected tubers from Pot A is shown in Fig. 3, and another of an injured and apparently dead eye from a tuber in Pot B in Fig. 4. Some of these artificially produced pustules were sectioned and showed abundant hyphae in the cells, together with the typical characteristics of the Skin spot pustules we had previously examined. It was finally necessary to recover the fungus from the pustules and identify it. This was done by sterilising the skin of the tubers and plating out sections of the pustules in the way already described. In every case a luxuriant growth of hyphae from the cells of the section into the surrounding media was obtained. These were apparently all of the same species and subsequent cultures established this fact together with the identity of the fungus as *O. pustulans* without any difficulty. It may be added that no bacterial or other fungoid contamination appeared on any of the plates. A photograph of one of the latter is shown in Fig. 5.

*Series* 2. Corky Scab inoculation.

The tubers in all four pots were badly disfigured with the sori of Corky Scab varying in diameter from 0·5 to 20 mms. The whiteness of the skin between the sori made it an easy matter to examine the tubers, but not a single pustule in any way resembling Skin spot could be found.

*Series* 3. *Oospora* and Corky Scab inoculation.

In all four pots a heavy infection of Corky Scab occurred similar to that shown in Fig. 2. Some typical discrete Skin spot pustules intermixed with the Corky Scab sori were also found as follows :—

| Pot. | No. of tubers per pot. | No. of tubers per pot showing typical Skin spot pustules. |
|---|---|---|
| A. | 17 | 4 |
| B. | 18 | 6 |
| C. | 20 | 8 |
| D. | 28 | 1 |

The pustules were precisely similar in appearance to those of Series 1, and, as there, they appeared mainly in the potato eyes. Sections of these were made, but no plasmodia were seen and in every respect the internal structure was identical with that of typical Skin spot.

In addition to the above, a few pustules were found in this series in which a mixed infection appeared to have taken place. Two of these pustules were closely examined. At first glance they were apparently normal Corky Scab sori 4 mm. in diameter on which the layer of spore balls was plainly visible. On closer examination, however, one or two blackish spots were seen on the surface, and on cutting through the sorus, the tissues were found to be darker in colour than is usual in Corky Scab. Microscopic examination showed the presence of a heavy layer of spore balls on the surface, and in the tissue below some hyphae were seen which closely resembled *O. pustulans*. It is very possible, therefore, that a mixed infection of the two parasites had occurred, and considering the heavy inoculums given of both fungi, it would have been rather strange if the infection had not coincided at some spots. There were, however, no indications of any effect of the one organism on the other taking place in these dual infection pustules such as was hypothecated before the experiment was carried out.

*Series* 4. Control.

Pot A. Here, unfortunately, a slight but definite contamination with Corky Scab had occurred, and two of the tubers showed small typical sori of the disease. No appearance of Skin spot was seen, however, and the remaining tubers were perfectly clean.

Pot D. All the tubers were absolutely smooth and clean as when they were inspected after harvesting.

Reference was made earlier in this paper to the fact that half the pots in the infection experiments were mulched with grass in order to keep them constantly damper than the other pots. It was hoped thereby to ascertain what relative effect, if any, such dry and wet conditions would have on the infections made. The season, however, was so uniformly wet that the mulching made little difference, and it was impossible to ascribe the greater or lesser infection in any pot to this treatment. We are not, therefore, in a position to say whether Skin spot is favoured by wet or dry seasons, or whether indeed it is affected at all by climatic conditions in this country. The deductions to be drawn from results of the experiments are obvious, and in our opinion they constitute conclusive proof that *Oospora pustulans* is the causative agent of Skin spot. The ample reproduction of the disease in typical form by means of pure cultures of the fungus under the conditions imposed is in itself sufficient evidence for this conclusion. If, however, further proof were needed, it is found in the fact that no pustules in any way reminiscent of Skin spot were reproduced by Corky Scab infection alone, but when, as in Series 3, *Oospora pustulans* was added to this, the two diseases Corky Scab and Skin spot appeared side by side.

Identification of Skin spot pustules.

So good a general description of Skin spot has already been given by Owen(7) that we do not wish to duplicate it. There are, however, a few points connected with the external and internal appearance of the pustules that we should like to comment on. In the first place, Owen differentiates between two types of pustule, a "pimple" form, and a form which she calls "flat", with a "crater-like" depression. She regards the former type as occurring on the coarser skinned varieties, such as Arran Chief, and the latter as being more common on the thinner skinned varieties such as King Edward. We cannot quite agree with her on this point. The potatoes used in our experiments were King Edwards, and here the smaller pustules were definitely pimple-like. As, however, the age and size of the pimple increased, so a dark depression gradually formed around it producing a crater-like appearance. It is easy to see how with the further development of this depression, and the natural shrinkage of the tuber, the crater-like impression would be intensified. We are strongly inclined to believe, therefore, that in all cases the pimple form is merely the early stage of the disease. The diameter of the artificially reproduced pustules (including the depression when present) varied from 0·5 to 2 mm. in diameter, the great majority having a diameter of 1 mm.

In the next place, Owen(7) describes the colour of the pustules as brown when wetted, whilst Carruthers(1) called them bluish black. This colour is most difficult to define on account of the curious and

characteristic sheen on the pustules. One of us favours Owen's description, and the other Carruthers', but we both agree that the colour is best defined by Ridgway's "Dusky Purplish Gray."(9)

The colour of the depression surrounding the pustule is similar to that of the pustule itself, and when many pustules coalesce a brownish purple patch is formed. No difficulty need be experienced, therefore, in distinguishing the pustules from the closed sori of Corky Scab of the same size.

*Internal Structure.* The internal structure of the pustule is also very distinctive in its characters, and we do not feel that the figures given by other investigators are sufficiently detailed in this respect. Shapovalov's figure(10), in fact, could be more easily taken for Corky Scab than Skin spot. We have sectioned over a hundred pustules in all stages taken from Ally, King Edward and Kerr's Pink potatoes and find the variation in structure surprisingly slight. Fig. 6 gives a composite drawing in which we have introduced every feature which we have met with in the disease, but, as already stated, the deviations from type are so slight that the figure may be taken as representing a typical Skin spot. A short description of the characters shown is given below :—

1. A mature pustule when cut across is found to extend to a depth of from 1 to 2 mm. It is black at the surface, shading to brown towards the base.
2. The most noticeable feature in microscopic examination is the presence of numerous cells with dark brown and much thickened walls. These cells are more or less empty, and their contents, if any, are brown and disorganised. Many of them are hypertrophied but the enlarged cells never show hypertrophy at right angles to the epidermis in the way that Kunkel(3) shows to be so characteristic of the "giant" cells in a young Corky Scab pustule. In mature pustules some of these diseased cells may be broken and crushed, but the areas of complete disorganisation so formed are not confined to the apex of the pustule as suggested by Shapovalov's(10) diagram. Miss Owen describes these cells as "cuticularised," and this term may serve to distinguish them, but, on staining sections in Sudan III, only those cell walls which have just started to thicken stain red. The thicker walls do not take up the stain.
3. Interspersed with the "cuticularised" cells are groups of clear cells with thin hyaline walls. These cells are more or less empty, but a nucleus, starch grains and protoplasmic contents in varying stages of degeneration may often be seen.
4. A well-marked cup-shaped layer of cork often six or more cells deep surrounds the pustule, extending on either side to within a few cells of the outer periderm. In some pustules this layer is not so well developed as in

Fig. 6. Vertical section of a Skin spot pustule showing :—A. Hyphae of *O. pustulans*. B. Cork layer. C. A patch of completely disorganised tissue. D. Degenerate cell contents. E. Remains of starch grains. F. Spherical black bodies associated with later stages of the disease.

others, but we have not yet come across any pustule in which it is entirely absent.

5. The much septated hyphae of *O. pustulans* are found in large numbers in the pustule. They are present in both the "cuticularised" and the thin walled cells, and in those of the latter which are invaded, one or more walls generally show the initial stages of "cuticularisation."

In sections of fresh material cut during the months March to June, the hyphae were hyaline and we have only seen brown hyphae on two occasions. The brown hyphae mentioned by Owen[7] may possibly be more numerous later in the season or on early maturing varieties of potatoes.

A comparison of the features described with those seen in a young sorus of Corky Scab is sufficient in itself to show that the two diseases are distinct entities. In fact, if this were not the case and the diseases were identical, we should have to believe that none of the characteristics of Skin spot described were ever noticed by Kunkel[3] in his work on Corky Scab. This we cannot think possible. We are, however, prepared to admit that in seed potatoes where the characteristic appearance of Skin spot is masked by the roughness of the skin or by soil particles clinging to the tuber, a certain rough resemblance to the young, closed sori of Corky Scab exists and is only dispelled by washing the potatoes. The comparison may be made on King Edward potatoes which often show numbers of immature Corky Scab sori and are also very prone to Skin spot. The pustules of the two diseases may be found on the same tuber, but a little experience soon enables a trained observer readily to distinguish between them.

In conclusion, we may say that, although there is no relation between Skin spot and Corky Scab, we may hazard a guess as to how the idea of synonymity has arisen in America.

In the first place, it appears that the superficial type of Corky Scab is more prevalent in America than the canker form and the immature sori associated with the former will frequently occur. An illustration of such sori is given by Shapovalov[10] in his Plate 3A. On the other hand, an inspection of his plates illustrating Skin spot reveals the fact that all are photographs of material received from England, Scotland or Denmark. It was only from this foreign material that *Oospora pustulans* could be isolated with any degree of constancy, whilst, in the American material, it was almost entirely absent. With these facts in mind we cannot help but suspect that the American material which Shapovalov[10] describes as "undoubted Skin spot" was not Skin spot at all. This indeed appears to be the only interpretation to place on his work. We are not in a position to say whether Skin spot disease really exists in America or not, but, remembering the preference of *O. pustulans* for a low range of temperature, we make the suggestion that the relatively high

soil temperature of potato growing areas in the United States is unfavourable for the development of the disease.

## Summary.

1. In a recent paper by Shapovalov[10] the generalisation has been made that Skin spot, as such, does not exist, but that the pustules called by that name are the immature sori of Corky Scab. Other fungi, such as *Oospora pustulans*, found in the pustules are stated to be secondary invaders of the Corky Scab sori.

2. An analysis of Shapovalov's argument shows that his conclusions are drawn from evidence which is for the greater part irrelevant, and from experimental results which are mainly negative. The most outstanding of these experimental results is the failure to reproduce Skin spot with cultures of *Oospora pustulans*. This fact, combined with the somewhat doubtful inoculation experiments previously recorded by Owen[7], raised some doubt as to the pathogenicity of *Oospora pustulans* in connection with the disease.

3. A series of inoculation experiments with pure cultures of *O. pustulans* was carried out by the present writers and was successful in reproducing an abundance of typical pustules of Skin spot. The infection occurred mainly in and about the "eyes" of the tubers.

4. Parallel series of inoculation experiments with *Spongospora subterranea* produced no pustules bearing any resemblance to Skin spot, but discrete Skin spot pustules and Corky Scab sori were produced in a third set of inoculations with inoculums of *Oospora pustulans* and *Spongospora subterranea* together. These results afford confirmatory evidence of the individual and separate nature of the two diseases.

5. The external appearance and the internal anatomy of a Skin spot pustule are extremely constant and characteristic. Sections of the pustules compared with Kunkel's[3] figures of Corky Scab sori show that there are few points of resemblance but many of striking difference between the two diseases.

6. The anatomical features of Skin spot are sufficient in themselves to distinguish the disease from any other.

7. There is no relation whatever between the two diseases, Skin Spot and Corky Scab, and the previous work of Owen who named *Oospora pustulans* as the causative organism of the former disease is completely confirmed by this work.

In conclusion, we tender our thanks to Mr. A. D. Cotton for his courtesy in putting the problem here discussed before us and to Dr. Shapovalov for his generosity in supplying us with a preliminary account of his hypothesis which has thus enabled us to reply to him so soon after the publication of his own paper.

Our thanks are also due to Mr. J. Manby, Leeds University, for the photographs.


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## XXVII.—PARACTAENUM NOVAE-HOLLANDIAE.

D. K. Hughes.

The identity of the genus *Paractaenum* described in Beauv. Agros. 47, t. x, f. 6, has long been a matter of doubt. Bentham in Fl. Austral. vii. 475, considered it as a depauperate form of *Panicum gracile* R. Br., but the spikelets, especially in shape and nervation, are quite different. In the British Museum there is a specimen sent from Paris in 1816 and written up *Paractaenum Novae-Hollandiae* Beauv. It was collected by Leschenault in "Îles Stériles" (probably Shark's Bay) in 1802, and is possibly the plant described by Beauvois, as it is very similar to his illustration (l.c.). The analyses of the spikelet agree perfectly, but the drawing is incorrect in that each spikelet really lies in a cavity between a bristle (which is broad, flat and either acuminate or obtuse) and the flattened rhachis. The description "locustae in cavitatibus axis subimmersae et ad illum appressae" gives a truer idea of the inflorescence. The author did not realise that the racemes disarticulated from the main axis. This important character at once distinguishes it from any of the genera with racemose inflorescences allied to *Panicum*, such as *Brachiaria* or *Paspalidium*, and shows an affinity rather to *Plagiosetum* in the *Cenchrastrae*. To this genus, too, it is very similar in the shape and nervation of the spikelets, and in the flattened rhachis, which, however, does not split up at the apex into a number of fine bristles. The species, of which Leschenault's plant is a very depauperate form, is well known under the name of *Panicum reversum* Mueller, though it has never been identified with Beauvois' plant described over half a century earlier.

An emended description together with a correct illustration of the genus is given below.

I, depauperate form of *Paractaenum novae-hollandiae* Beauv., natural size; II, part of inflorescence, x 4; III, part of fully developed inflorescence of "*Panicum reversum*" F. Muell., x 4; IV, spikelet, x 8; V, fertile floret, x 8; VI, valve of same, x 8.

**Paractaenum** *Beauv.* Agrost. 47, t. x, f. 6. [Gramineae-Cenchrastreae] emend. *Hughes.*

*Spiculae* singulae inter setam planiusculam et rhachidem alatam subexcavatam (vel nonnunquam seta nulla) in racemis tandem reflexis demum deciduis dispositae. *Glumae* inaequales; inferior paucinervis spicula dimidio brevior; superior multinervis, spiculam aequantem. *Anthoecium* inferum ad valvam herbaceo-membranaceam spiculam aequantem reductum. *Anthoecium* superum $\frac{\delta}{+}$; valva membranacea paulo indurata, marginibus apice brevissime ciliolatis non inflexis; valvula valvam aequans. *Lodiculae* 2, minutissimae. *Stamina* 3. *Ovarium* glabrum. *Gramen* annuum, vagans. *Foliorum* laminae planae, flaccidae. *Inflorescentia* angusta; axis elongatus; racemi alterni rhachide latiuscula apice seta terminata.

Species unica, Australiensis.

**P. novae-hollandiae** *Beauv.* l.c.; *Panicum paractaenum* Kunth. Enum. i, 134; *P. reversum* F. Muell. Fragm. viii, 152; Benth. Fl. Austral. vii, 478.

W. Australia: Murchison River, *Oldfield;* Shark's Bay (?), Iles Stériles, *Leschenault;* and without precise locality, *Drummond.*

S. Australia: Vicinity of Lake Eyre, *Andrews* 44.

N. Territory: Lake Amadeus, *Giles.*

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## XXVIII.—NEW SPECIES OF RINOREA FROM WEST AFRICA.

T. F. Chipp.

The considerable acquisition of material from Tropical Africa during the past few decades is well illustrated in this present genus of *Violaceae.* In the Flora of Tropical Africa (1868) but thirteen species are described whereas at present about 100 are known within the range of the Tropical African flora. Their distribution is approximately 62 in Upper Guinea, 30 in the remainder of tropical Africa and some 10 in Madagascar and the Mascarene Isles. A revision of the Upper Guinea species in connection with a study of the West African Forest Region shows that these 62 species are general confined to that floral region* and only in a few cases penetrate into east and south east Africa. They appear to represent typical elements of their region and are not recorded outside the forest or as intermingling with the surrounding East African Steppe flora. The distribution in Upper Guinea is:—Senegambia 2, French Guinea 4, Sierra Leone 9, Liberia 8, Ivory Coast 1, Gold Coast 4, Togo 1, Southern Nigeria 11, Cameroons 39, Fernando Po, Princes and San

* Engler and Drude, Die Vegetation der Erde, ix. 1, 2. p. 1006.

Thomé 4. Although the percentage of distribution appears to bear a relation to the distribution of forest too much stress should not be laid on these results in any attempt at working out the endemic West African Forest elements in view of the varying intensity of investigation of the flora carried out in the different Upper Guinea colonies and protectorates.

The periodic seasons of the species are little marked in the Cameroons, several flowering and fruiting throughout the year though the greater number appear to flower from January to April and August to September. Elsewhere in Upper Guinea the flowering period is chiefly December to May. There are but few records of fruiting. The information relative to the distribution and seasons in Upper Guinea for these species appears normal for a pantropic hydrophilous genus.

After the revision of the Upper Guinea material the following new species and combinations resulted. The detailed key and records of the Upper Guinea species are being held over for subsequent publication.

Dr. A. B. Rendle very kindly permitted examination of the undetermined material at the British Museum (Natural History) and several of the new species have been based on these specimens.

In preparing a key to the 62 Upper Guinea species it was not found possible to follow any apparent natural divisions which doubtless could be worked out were the whole genus being monographed. An artificial key had therefore to be arranged and the following abstract shows the relative places in it of the new Upper Guinea species.

Leaf margin not spiny.
  Petals if reflexed, only at the tip.
    Leaves sub-auriculate at the base.
      Anthers subsessile - - - - - *subauriculata*
    Filaments distinct
      Lamina up to 15 cm. long.
        Bracts of inflorescence about 2 mm. long, medianly pilose.
          Leaf margin entirely denticulate, main lateral nerves 9–12. Tree to 20 ft. high - - - - - *kibbiensis*
      Lamina 20–30 cm. long.
        Stipules early deciduous. Flowers about 5 mm. long. - - - - *oblanceolata*
    Leaves obtuse, acute or cuneate at the base.
      Sepals not markedly fanwise ribbed.
        Leaves glandular beneath.
          Inflorescence several cm. long. Extremities covered with short rather stiff hairs, lamina oblanceolate, abruptly acuminate. Sepals 2 mm. long.
            Ovary strigose-pilose - - - *punctata*
            Ovary warted or later furfuraceous - *verrucosa*

Leaves not glandular beneath.
Flowers 1 or few in the axils of the leaves, or on very short racemes about 5 mm. long. - - - - - *breviracemosa*
Inflorescence 1 to several cm. long.
Ovary pilose, at least when young.
Petioles 1–3 cm. long.
Leaves membranous, 9–10 cm. long. Inflorescence glabrous. Sepals glabrous. Filaments short. Ovary sparsely pilose - *Aylmeri*
Leaves subcoriaceous, 15–18 cm. long. Inflorescence pubescent. Sepals externally strigose. Anthers sessile. Ovary densely pilose - - - *pilosa*
Petioles 3– several cm. long. - *rubrotincta*
Ovary furfuraceous, glabrous or at first slightly pubescent.
Pedicels 3 mm. long or less.
Petioles 2–8 cm. long.
Sepals glabrous or pubescent.
Flower buds about 2 mm. long. Lamina generally 3 or more times as long as broad.
Staminal tube lobes not free - - - - *adnata.*
Staminal tube lobes free *parviflora*
Flower buds 3–4 mm. long. Lamina generally 2–2½ times as long as broad.
Staminal tube with free lobes between the anthers - - - *oblongifolia*
Staminal tube lobes not free - - - - *Batesii*
Petioles less than 2 cm. long, at least on the upper leaves.
Inflorescence about 4 cm. long or less, at time of flowering.
Sepals 2·5–3 mm. long - *ovata*
Sepals 1·5 cm. long or less *sinuata.*

**Rinorea subauriculata** *Chipp;* affinis *R. Zenkeri* Engl., sed inflorescentiis et bracteis minoribus, floribus crebris, antheris subsessilibus, differt; a *R. castaneoidi* Welw., laminis subcoriaceis integris longe acuminatis, petiolis brevioribus, differt.

*Frutex* circiter 3m. altus, ramulis minute puberulis. *Folia* subcoriacea, glabra, elliptica, basim angusta, basi ipsa sub-

auriculata, apice longe acuminata, margine fere integra, 17–20 cm. longa, 5–8 cm. lata; nervi laterales utrinsecus 7–9; petioli 5 mm. longi. *Inflorescentia* puberula, ramulis inferioribus elongatis ascendentibus; bracteae angustae, lanceolatae, 2 mm. longae; flores circiter 5 mm. longi; pedicelli 1 mm. longi. *Sepala* pubescentia, obtusa, 5 mm. longa. *Tubus stamineus* margine libero instructus; filamenta brevissima vel deficientia; appendicula obtusa tam longa quam thecae; connectivum bifidum ultra thecas productum. *Ovarium* glabrum.

Tropical Africa. Cameroons; Kongui River, Mt. John, flowering August, *Mann* 1778.

**Rinorea kibbiensis** *Chipp;* affinis *R. Bussei* M. Brandt, sed arbor foliis margine totis denticulatis, nervis lateralibus paucioribus.

*Arbor* 7 m. alta, ramulis pilosis. *Folia* membranacea, superne glabra subnitida, subtus laxe pilosa, subpanduriformia, apice breviter acuminata, basi subauriculata, 12–16 cm. longa, 4–6 cm. lata; nervi laterales utrinsecus 9–12. *Inflorescentia* laxiflora, circiter 7 cm. longa, rachide pilosa, ramulis inferioribus elongatis ascendentibus; bracteae angustae, lanceolatae, ciliatae, costa pilosa, 4 mm. longae. *Flores* 4 mm. longi. *Sepala* lanceolata, acuta, extus pubescentia, 2 mm. longa 1 mm. lata. *Petala* alba, oblonga, apice obtusa, 3 mm. longa, 1·3 mm. lata. *Tubus stamineus* margine paulo libero, lobis antheris oppositis; filamenta 1–1·5 mm. longa; appendicula petaloidea apice obtusa, truncata vel emarginata; thecae apiculatae apice divergentes. *Ovarium* pilosum.

Tropical Africa. Gold Coast; Kibbi Hills, flowering December, *Johnson* 507.

**Rinorea oblanceolata** *Chipp;* affinis *R. longisepalae* Engl., sed ramulis petiolisque minute puberulis, costis atque nervis lateralibus glabris, stipulis mox caducis, laminis longioribus, paniculis foliorum dimidiam partem aequantibus, petalis quam sepala subduplo longioribus, tubo stamineo inaequaliter lobato, differt.

*Frutex. Folia* glabra, oblanceolata, basim angusta, basi ipsa subauriculata, apice acuminata, margine in parte superiore denticulata, 22–26 cm. longa, 9 cm. lata; nervi laterales circiter 12; petioli minute puberuli 0·7–1 cm. longi; stipulae mox caducae. *Inflorescentia* paniculata, ramulis inferioribus brevissimis 3–5 floris; rachis pedicellique indumento petiolarum; bracteolae minutae, circiter 1 mm. longae; pedicelli 1·5 mm. longi. *Sepala* ovata, subacuta, margine fimbriato-ciliolata, 2 mm. longa, 1·5 mm. lata. *Petala* oblonga, subobtusa, 3·5 mm. longa, 1·5 mm. lata. *Tubus stamineus* inaequaliter lobatus, margine libero; filamenta marginem manifeste superantia, 1 mm. longa; appendicula basim angusta, apice obtusa; connectivum bifidum, ultra thecas productum. *Ovarium* pubescens.

Tropical Africa. Liberia; Begwai, flowering October, *Bunting* 21.

**Rinorea punctata** *Chipp;* species laminis subtus glandulosis, inflorescentiis longis, petiolis brevibus, ramulis junioribus rachidibusque pilosis, tubo stamineo in lobos lineares ante antheras producto distincta.

*Ramuli*, petioli, rachides pilis rigidis obtecti. *Folia* oblanceolata, superne glabra, subtus praecipue ad costam pilosa, glandulosa, basim angusta basi ipsa subobtusa, apice abrupte acuminata, margine toto dentata, 10–12 cm. longa, 4–5 cm. lata; nervi laterales utrinsecus 7–9; petioli usque ad 1 cm. longi. *Inflorescentia* racemosa, elongata, usque ad 12 cm. longa, ramulis inferioribus 5 mm. longis; bracteolae oblongae, acutae, 3 mm. longae. *Sepala* rotundata, margine fimbriata, 1·5 mm. longa. *Petala* oblonga, apice reflexa, circiter 4·5 mm. longa. *Tubus stamineus* ante antheras in lobos lineares liberos productus; filamenta distincta; appendicula ad basim angusta; connectivum peltato-laminatum, ultra thecas productum. *Ovarium* strigoso-pilosum.

Tropical Africa. Nigeria; Eket District, *Talbot.*

**Rinorea verrucosa** *Chipp;* species laminis margine denticulatis subtus glandulosis, petiolis pedicellisque brevibus, inflorescentiis laxe paniculatis, appendicula ex apice connectivi orta, ovario verrucoso, distinguitur.

*Frutex* ad 1 m. altus, ramulis junioribus glabris atris. *Folia* membranacea, late elliptica, basi rotundata vel obtusa, apice breviter acuminata, margine denticulata, superne glabra, subtus pallidiora glanduloso-punctata, 14–18 cm. longa, 6·5–8 cm. lata; nervi laterales utrinsecus circiter 13, superne inconspicui, subtus prominentes; petioli atri, canaliculati, circiter 1 cm. longi. *Inflorescentia* laxe paniculata, 6 cm. longa, rachide glabra atra, ramulis inferioribus saepe furcatis ultimum 1–3 floribus; bracteae mox deciduae; bracteolae squamiformes; pedicelli 3 mm. longi. *Sepala* lanceolata, acuta, margine inconspicue ciliolata, 3 mm. longa. *Petala* oblonga, paulum fimbriata, 5 mm. longa. *Filamenta* brevia; lobi tubi staminei liberi thecas oppositi; appendicula rotundata apice connectivi orta; connectivum bifidum, ultra thecas productum. *Ovarium* valde verrucosum (adultum furfuraceum ?).

Tropical Africa. Cameroons; Efulen, Forest Hill, flowering June, *Bates* 233.

*Zenker* 4639 from Bipinde, Cameroons, mature fruit only, probably belongs to this species.

**Rinorea breviracemosa** *Chipp;* a speciebus madagascariensibus *R. angustifolia* Baill. *R. latifolia* O. Ktze. *R. pubescente* Baill., stipulis linearibus elongatis, inflorescentiis brevioribus, pedicellis gracilibus elongatis, sepalis longioribus, distinguitur.

*Arbor* ramulis dense pubescentibus. *Stipulae* lineares, strigoso-pilosae, 0·5–1 cm. longae. *Folia* late elliptica, glabra, basi rotundata vel obtusa. apice breviter acuminata, 8–10 cm. longa, 3–5 cm. lata; nervi laterales utrinsecus 8–10; petioli 2–5 mm. longi. *Inflorescentiae* breves circiter 7 mm. longae; bracteae

obtusae, pilosae, 2 mm. longae. *Pedicelli* graciles, 5 mm. longi. *Sepala* oblonga, extus pilosa, 2·5–3 mm. longa. *Petala* linearia, apicibus recurvatis, 5 mm. longa. *Tubus stamineus* margine libero instructus, lobis antheris oppositis; filamenta brevia, appendicula petaloidea, connectivum bifidum, ultra thecas productum. *Ovarium* novellum minute tuberculatum. *Capsula* pallida, reticulata, 1 cm. longa; semina straminea, 7 mm. longa, 5 mm. lata.

Tropical Africa. Sierra Leone; small tree flowering May, *Barter;* York Pass, medium size tree by river banks in the Rain Forest, fruiting June, *Sierra Leone Herbarium* 53; without precise locality, *Aylmer*, 38.

**Rinorea Aylmeri** *Chipp;* affinis *R. insulari* Engl., sed nervis lateralibus paucioribus, sepalis medio crassis, connectivis antherarum indivisis ultra thecas paulum productis, differt.

*Frutex* ramulis pilosis. *Folia* membranacea, glabra, oblanceolata, obscure dentata, basim angusta, basi ipsa rotundata vel obtusa, apice breviter acuminata, 9–10 cm. longa, 3–4 cm. lata; nervi laterales utrinsecus 6–8. *Inflorescentiae* glabrescentes, paniculatae, ramulis inferioribus elongatis ascendentibus; pedicelli 1 mm. longi; bracteolae 2 mm. longae. *Sepala* medio crassa, obtusa, glabra, 1 mm. longa. *Petala* subacuta, 3 mm. longa. *Tubus stamineus* margine libero instructus; filamenta brevia; appendicula laminata; connectivum indivisum ultra thecas paulum productum. *Ovarium* parce pilosum.

Tropical Africa. Sierra Leone; Pujehun, flowering April, *Aylmer* 63.

**Rinorea pilosa** *Chipp;* affinis *R. adnatae* Chipp, sed floribus majoribus, sepalis extus strigosis, tubo staminео inaequaliter lobato, connectivo late ligulato ultra thecas producto, ovario dense piloso, differt.

*Ramuli* juniores teretes, glabri. *Folia* subcoriacea, glabra, non punctata, elliptica vel lanceolata, basi obtusa vel rotundata, apice breviter acuminata, margine serrulata, 15–18 cm. longa, 6 cm. lata; nervi laterales utrinsecus 10–12; petioli canaliculati, glabri, 2–3 cm. longi. *Inflorescentia* spiciformis, terminalis, usque ad 10 cm. longa, ramulis inferioribus 0·5–1 cm. longis, rachide pubescenti; pedicelli 2 mm. longi. *Sepala* oblonga, apice obtusa, extra margineque setosa, 2·5–3·5 cm. longa. *Petala* fere ligulata, basi angusta, margine fimbriata, 5 mm. longa, 1 mm. lata. *Tubus stamineus* inaequaliter lobatus; lobi liberi antheris oppositi; thecae basi dense pilosae; appendicula oblonga latere valde involuta; connectivum late ligulatum ultra thecas productum; tubus appendiculaque toto 4 mm. longa. *Ovarium* junius dense pilosum; stylus 4 mm. longus.

Tropical Africa. Southern Nigeria; Oban, 1912, *Talbot.*

**Rinorea rubrotincta** *Chipp;* species laminis subtus rubrotinctis, petiolis longis tenuibus ad ramulos et laminas incrassatis distincta.

*Ramuli* pallidi teretes, juniores minute pubescentes. *Folia* membranacea, superne glabra viridia, subtus pallidiora inaequaliter rubrotincta ad costam parce pubescentia, oblonga vel oblanceolata, basi obtusa, apice abrupte acuminata, margine inaequaliter denticulata, 16–20 cm. longa, 5–7·5 cm. lata; nervi laterales utrinsecus circiter 10; petioli pubescentes, tenues, ad ramulos et laminas incrassati, 2·5–5 cm. longi. *Inflorescentia* terminalis rare axillaris, usque ad 5 cm. longa, rachide dense minute pilosa, ramulis inferioribus paulum elongatis ascendentibus 1 cm. longis: bracteolae angustae, lanceolatae, acutae, 2·5 mm. longae; pedicelli 1 mm. longi. *Flores* penduli. *Sepala* oblonga, dorso pilosa, apice rotundata, ciliolata, 2·5–3 mm. longa, 2 mm. lata. *Petala* oblonga, apice rotundata reflexa, margine minute fimbriata, 4 mm. longa, 1 mm. lata. *Tubus stamineus* brevis, non liber nec ante antheras incrassatus; thecae pilosae, sessiles, 2 mm. longae; appendicula oblonga, apice obtusa, extus pilosa; connectivum bifidum petaloideum ultra thecas paulum productum. *Ovarium* dense sericeo-strigosum.

Tropical Africa. Liberia; Begwai, on old farm land, flowering October, *Bunting* 155.

**Rinorea adnata** *Chipp;* affinis *R. Preussii* Engl. et *R. kamerunensi* Engl. sed staminibus basi adnatis tuboque deficiente, connectivo laminato apice sinuato ultra thecas producto, differt.

*Frutex* glaber. *Folia* subcoriacea, elliptica vel oblonga, integra vel obscure dentata, basim angusta, basi ipsa rotundata vel obtusa, apice acuminata, 20–30 cm. longa, 6–8 cm. lata; nervi laterales utrinsecus 12–14; petioli 2–4 cm. longi. *Inflorescentia* glabra vel minute puberula, circiter 10 cm. longa, ramulis inferioribus furcatis 5 mm. longis; bracteolae acutae, 1–2 mm. longae; flores 2 mm. longi; pedicelli 1–2 mm. longi. *Sepala* extus minute puberula, minute ciliolata, rotundata, 2 mm. longa. *Petala* oblonga, obtusa, 2 mm. longa, 1·5–2 mm. lata. *Stamina* basi adnata; appendicula intus basi extus dorso sericeo-pilosa, apice truncata vel emarginata vel rotundata; thecae sessiles; connectivum laminatum apice fimbriatum ultra thecas productum. *Ovarium* glabrum.

Tropical Africa. Cameroons; Bipinde, flowering September, *Zenker* 1084.

This specimen was originally referred to *R. kamerunensis* Engl. in Engl. Bot. Jahrb. 33 : 140.

**Rinorea parviflora** *Chipp;* affinis *R. Welwitschii* O. Ktze., sed foliis majoribus margine fere integris, petiolis longioribus rachidibus glabris differt; a *R. adnata* Chipp. foliis basi cuneatis subtus glandulosis rachidibus staminisque glabris distincta.

*Ramuli* juniores teretes, glabri. *Folia* ovata vel lanceolata, glabra, subcoriacea, subtus glandulosa, basi cuneata, apice acuminata, margine fere integra, 15–22 cm. longa, 6–8 cm. lata; nervi laterales utrinsecus circiter 9, superne impressa, subtus prominentes; petioli glabri, canaliculati, 2–4 cm. longi. *Inflorescentia* 4–5 cm. longa; rachis glabra, ramulis brevibus, alabrastris

2 mm. longis, bracteolis subamplexicaulibus medio incrassatis subacutis. *Sepala* ovata vel rotundata, margine ciliolata, extra minute velutina, 2 mm. longa. *Petala* immatura tantum visa. *Stamina* glabra, basi adnata; antherae sessiles, appendicula oblonga basim angustata apice obtusa vel emarginata 1·5 mm. longa; connectivum laminatum, apice sinuatum, ultra thecas productum. *Ovarium* glabrum.

Tropical Africa. Southern Nigeria; Oban, *Talbot* 1391. Gabon; Gabon River, *Mann*.

In the Fl. Trop. Afr. 1 : 111, Mann's specimen is doubtfully referred to *A. Welwitschii*. Oliv.

**Rinorea oblongifolia** *Marquand;* affinis *R. Welwitschii* O. Ktze, sed foliis majoribus non punctatis, petiolis longioribus, nervis lateralibus multioribus, ramulis inferioribus inflorescentiae elongatis saepe furcatis ascendentibus, floribus majoribus, differt.

*Arbor* parva ramulis glabris vel pubescentibus. *Folia* membranacea, elliptica vel oblonga, basi acuta vel obtusa, apice acuminata, margine integra vel late dentata, 20–30 cm. longa, 6–8 cm. lata; nervi laterales utrinsecus circiter 10; petioli 2–4 cm. longi. *Inflorescentia* terminalis paniculata ramulis inferioribus elongatis furcatis ascendentibus; flores 3–5 mm. longi; pedicelli 1 mm. longi; bracteolae mox deciduae. *Sepala* rotundata, obtusa, fimbriata, 3–4 mm. longa. *Petala* oblonga, basi angusta, 5–6 mm. longa. *Tubus stamineus* margine inter antheras vel inaequaliter lobatus, filamenta distincta vel deficientia, appendicula obtusa, connectivum bifidum ultra thecas productum vel thecae apiculatae apice divergentes. *Ovarium* novello pubescens, mature furfuraceum.

A very variable species, especially as regards the lamina, the inflorescence, the size of the flower, the staminal tube margin, and the hairiness of the young ovary. It has not been possible to separate any of the specimens as distinct owing to the gradual series represented. The species is based on *Bates* 432, originally described as *Pittosporum oblongifolium* C. H. Wright (*K.B.* 1897, p. 243). The Upper Guinea specimens mentioned in the Flora Tropical Africa 1 : 111 are transferred to this species, Welwitsch's Angola specimens being regarded as the type of *R. Welwitschii*.

Tropical Africa. Senegambia, 1838, *Heudelot*. Sierra Leone; near Kambia, Scarcies, flowering December, *Scott Elliot* 4195; York Pass, shrub in the Rain Forest, flowering December, 2–4, 12, 1910, *Lane-Poole; Scott Elliot* 5904. Gold Coast; Larte, small tree flowering October, *Johnson* 805; Coomassie, *Cummins* 202–228–42. Nigeria: Oban, 1912, *Talbot;* Old Calabar, *Thomas* 100: Cross River, *McLeod*. Cameroons; Cameroons River, shrub to 20 feet high, corolla yellow, flowering January, *Mann* 737; Abonando, flowering March, *Rudatis* 22; Yaunde, in the forest, *Zenker & Staudt* 135b, 148, 148a, 679; between Yaunde and Dengdeng, flowering March, *Mildbraed* 8528; Efulen, *Bates* 432; Yaunde, Bitye, *Bates* 1071, 1420, 1543; Bipinde, in the forest, *Zenker* 876, 1020, 2320, 2793, 4031

4172, 4354, 4429. Gabon: Sibange, *Soyaux* 369. Bahr el Ghazal; am Yuru, *Schweinfurth* Ser. III 299; am Mbrwole, *Schweinfurth* 3079; am Draghe, *Schweinfurth* 3083.

**Rinorea Batesii** *Chipp;* affinis *R. arenicolae* Brandt, petiolis longioribus, laminis subtus non glandulosis, floribus majoribus, differt: a *R. oblongifolia* Marq., lobis tubi staminei non liberis distinguitur.

*Ramuli* juniores teretes, striati, glabri. *Folia* glabra, late elliptica, basi rotundata, apice breviter acuminata, margine paulisper undulata, 14–16 cm. longa, 5–7 cm. lata; nervi laterales circiter 7; petioli glabri, tenues, canaliculati, usque ad 5 cm. longi. *Inflorescentia* terminalis, 5 cm. longa, rachide dense hirsuta; pedicelli 4 mm. longi; bracteolae lineares, margine ciliatae, 2 mm. longae. *Sepala* rotundata, apice obtusa, extra pilosa, margine ciliata, 3 mm. longa. *Petala* obovata, apice reflexa, 5 mm. longa, apice 3 mm. lata. *Antherae* subsessiles, basi pilosae; thecae apiculatae apice divergentes; lobi tubi staminei dorso thecarum incrassati non liberi; appendicula oblonga. *Ovarium* glabrum.

Tropical Africa. Cameroons; Bitye, Yaunde, *Bates* 1592.

**Rinorea ovata** *Chipp;* affinis *R. variae* Chipp, sed planta tota glaberrima, alabastris rotundatis, bracteolis parvis et mox deciduis, sepalis inaequalibus margine fimbriatis.

*Ramuli* juniores teretes, sulcati, straminei. *Folia* subcoriacea, late ovata, basi rotundata, apice abrupte acuminata, margine minute denticulata, subtus costa nervisque prominente stramineis; nervi laterales utrinsecus 7–9; petioli incrassati, 1–2 cm. longi. *Inflorescentia* terminalis, circiter 4 cm. longa, rachide sicca valde sulcata; bracteae mox deciduae; bracteolae, oblongae, acutae, 1·5 mm. longae; pedicelli incrassati, valde articulati, 1 mm. longi. *Sepala* coriacea, fere glauca, concava, rotundata, margine fimbriata, exteriora 1·5 cm., interiora 2·5 mm. longa. *Petala* (immatura) oblonga, concava, 2 mm. longa. *Antherae* sessiles, basi adnatae; tubus stamineus vix adest; appendicula laminata, apice obtusa; connectivum indivisum, apice fimbriatum, ultra thecas pilosas productum. *Ovarium* glabrum.

Tropical Africa. Cameroons; Bipinde, in the forest, *Zenker* 4444.

**Rinorea sinuata** *Chipp;* affinis *R. acutidenti* M. Brandt, sed ramis glabris, petiolis glabris canaliculatis, laminis majoribus, inflorescentiis longioribus, differt.

*Folia* elliptica, glabra, subcoriacea, basi subacuta vel obtusa, apice breviter acuminata, margine denticulata, 18–24 cm. longa, 7–10 cm. lata; nervi laterales 8–10, subtus ita ut costa venaeque majores valde prominentes; petioli usque ad 2 mm. longi, valde canaliculati. *Inflorescentia* circiter 4–5 cm. longa, rachis pedicellique glabri; pedicelli 1 mm. longi; bracteae lineari-lanceolatae acutae, pilis rigidis adpressis obsitae; bracteolae minutae.

*Sepala* rotundata, obtusa, extra glabra, margine ciliata, 1·5 mm. longa. *Petala* lanceolata, apice acuta, intus minute pubescentia, 3 mm. longa. *Tubus stamineus* inaequaliter lobatus vel cuspidato-sinuatus; filamenta distincta, glabra; appendicula quam thecae lata et paulum longior, apice subobtusa; connectivum indivisum ultra thecas dimidio productum. *Ovarium* glabrum.

Tropical Africa. Cameroons; Jaunde, flowering January, *Mildbraed* 7858.

## New Species from Lower Guinea.

**Rinorea varia** *Chipp;* species laminiis variis late ovatis vel longe oblongis, inflorescentiis brevibus, sepalis coriaceis, antheris sessilibus fere liberis, ovario glabro, distincta.

*Ramuli* teretes glabri, longitudinaliter striati. *Folia* glabra, varia late ovata vel longe oblonga, apice acuminata, basi rotundata, margine indistincte undulata, superne costa nervisque impressis subtus valde prominentibus, 15–20 cm. longa, 7–10 cm. lata; nervi laterales utrinsecus circiter 7; petioli ampli, glabri, 1–2 cm. longi. *Inflorescentia* usque ad 4 cm. longa, rachide pubescenti sulcata; bracteolae lanceolatae, acutae, ciliatae, 3 mm. longae; pedicelli incrassati, 1 mm. longi; alabastra oblonga. *Sepala* oblonga, apice obtusa, margine ciliolata, 3 mm. longa. *Petala* elliptica, obtusa (adulta non visa). *Antherae* sessiles, basi adnatae; tubus stamineus vix adest; appendicula laminata apice obtusa; connectivum indivisum apice sinuatum ultra thecas productum. *Ovarium* glabrum.

Tropical Africa. Congo; *Smith* (*Herb. Brown*).

**Rinorea bracteolata** *Chipp;* affinis *R. adnatae* Chipp, sed nervis lateralibus paucioribus ascendentibus, laminis basi cuneatis, differt.

*Frutex* (?) glaber. *Folia* oblanceolata, crenulata, basi cuneata, apice valde acuminata, 20–30 cm. longa, 6–8 cm. lata; nervi laterales ascendentes, utrinseous 8–10; petioli 2–3 cm. longi. *Inflorescentia* glabra, circiter 10 cm. longa; bracteolae persistentes, acutae 1–2 mm. longae; pedicelli 1–2 mm. longi. *Sepala* rotundata, obtusa, 2 mm. longa. *Petala* oblonga, obtusa, 2–3 mm. longa, 1·5–2 mm. lata. *Stamina* basi adnata, appendicula basi sericeo-pilosa, apice truncata vel emarginata; antherae sessiles; connectivum bifidum, ultra thecas productum. *Ovarium* glabrum.

Tropical Africa. Gabon River, *Mann.*

This specimen was doubtfully referred by Oliver to *R. Welwitschii* in Fl. Trop. Africa. 1 : 111.

**Rinorea glaucophylla** *Chipp;* species laminis glaucis subcoriaceis, thecis dorso appendicularum toto adnatis, inflorescentiis laxis elongatis paucifloris distincta.

*Frutex* ramulis junioribus glabris apicem versus atro-viridibus. *Folia* subcoriacea, oblonga, basi obtusa, apice breviter acuminata, margine obscure denticulata, superne glauca, subtus glabra,

17–20 cm. longa, 6–8 cm. lata; nervi laterales utrinsecus circiter 8, superne inconspicua, subtus costa nervisque prominentibus; petioli versus apicem basimque atro-virides, 1·5–3 cm. longi. *Inflorescentia* laxe paniculata, pauciflora, usque ad 20 cm. longa, ramulis inferioribus 2 cm. longis furcatis, rachide pubescenti; bracteolae primariae persistentes, ovatae, acutae, margine ciliatae, 3 mm. longae; pedicelli 3–5 mm. longi. *Sepala* rotundata, fimbriata, 3 mm. longa. *Petala* oblonga, basi sensim angusta, apice subacuta, 5 mm. longa, 3 mm. lata. *Stamina* basi adnata; thecae appendiculis dorso toto adnatae; appendicula acuta, 5 mm. longa; connectivum ultra thecas vix productum. *Ovarium* globosum, glabrum.

Tropical Africa. Gabon; Mfoa, shrub 6–8 feet high, flowering and young fruit October, *Bates* 563.

### New Combinations.

The following Upper Guinea species do not seem to have been referred to *Rinorea* since the re-establishment of that name for the genus.

| | | | | | |
|---|---|---|---|---|---|
| *Alsodeia* | *Johnstonii* | Stapf. = | *Rinorea* | *Johnstonii* | Chipp. |
| ,, | *prasina* | Stapf. = | ,, | *prasina* | Chipp. |
| ,, | *crassifolia* | Bak. f. = | ,, | *crassifolia* | Chipp. |
| ,, | *obanensis* | Bak. f. = | ,, | *obanensis* | Chipp. |
| ,, | *Talbotii* | Bak. f. = | ,, | *Talbotii* | Chipp. |

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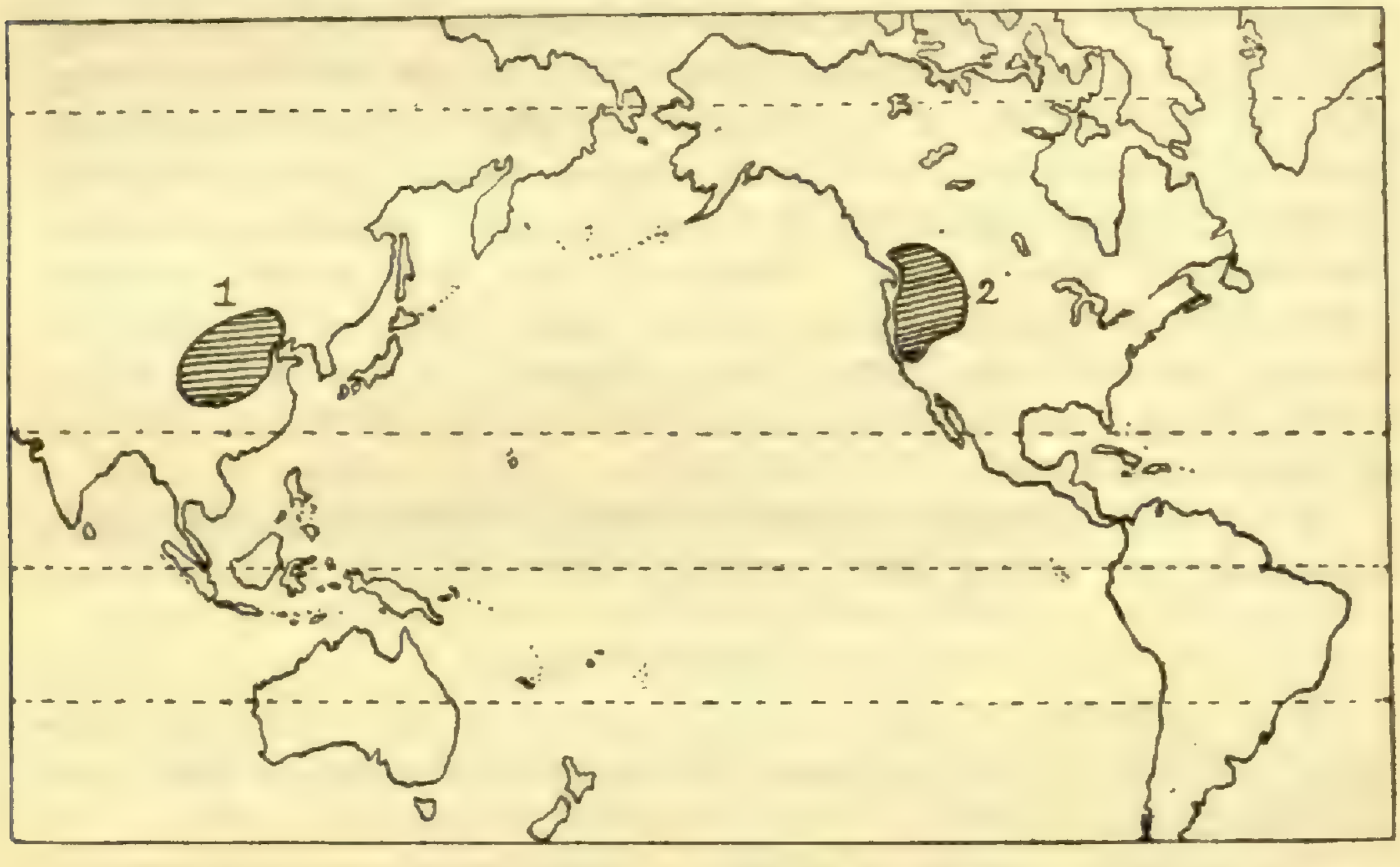
## XXIX.—AFFINITY OF RHODODENDRON MICRANTHUM.

J. Hutchinson.

The family *Ericaceae* is particularly interesting in the group *Gamopetalae* on account of several primitive features which point to alliance with the *Polypetalae*. Even in *Ericaceae* there are several genera which are characterised by having free petals. These are *Leiophyllum*, *Ledothamnus*, *Cladothamnus*, *Elliottia*, *Ledum* and *Befaria*. And in endeavouring to trace the phylogeny of those more numerous genera with united petals, one would naturally turn to the more primitive ones such as those mentioned. In revising the arrangement of these in the herbarium recently, I was impressed by the great resemblance of *Ledum glandulosum* Nutt., with *Rhododendron micranthum* Turcz. The true affinity of *Rhododendron micranthum* (figured in Botanical Magazine t. 8198) has long been rather a puzzle. It belongs to the lepidote group of the genus, and has very small and numerous flowers arranged in terminal racemes. It occurs near the summits of the mountains from Western Szechuan to the Pekin district, i.e. almost throughout Northern China. *Ledum glandulosum* Nutt. has a wide range at high altitudes on the Rocky Mountains from Alberta and British Columbia to Wyoming and California. The

approximate distribution of these two species is shown in the accompanying map.




1. Distribution of *Rhododendron micranthum* Turcz; 2, of *Ledum glandulosum* Nutt.

It will be observed that these two areas of distribution are nearly in the same latitude, that of the *Ledum* extending slightly further north. The genus *Ledum* is undoubtedly more primitive than *Rhododendron*, on account of its polypetalous corolla, and it enjoys a very wide distribution in the Northern Hemisphere. I suggest that the origin of such a species of *Rhododendron* as *R. micranthum* may have been from an ancestral type similar to the present day *Ledum glandulosum*, which species has many characters in common, but is separated generically mainly by its free petals. I do not suggest that *R. micranthum* has arisen directly from the genus *Ledum* as it exists at the present day, for we have to remember that evolution has probably been equally rapid in the two genera. I give below the records of the two species in the Kew Herbarium :—

**Rhododendron micranthum** *Turcz.*

China. Western Szechuan : Tchen-keou-tin, *Farges* 1258; West and near Wen-ch'uan Hsien, 6000–7800 ft., *Wilson* 1200; Lifan Ting, *Wilson* 1320. Hupeh : Monte Triora, *Silvestri* 1702; 1703; Fang, *Henry* 6632; Nanto, *Wilson* 1526; *Wilson* 660; Shense : In-kia-po, *Giraldi ;* Mt. Thui-kio-san, *Giraldi.* Shansi : near Hsi-po-po, *Meyer* 1697. Kansu : near Kwa-tsa, *Meyer* 1825; *Potanin.* Chili : Pekin, *Bretschneider ;* Top of Mt. Conolly, *Bullock* 86; rocky exposed mountain ridges, 7000–10,000 ft., near Hsien Wu-tai-shan, *Meyer* 1334; Weichang, *Purdom* 55.

**Ledum glandulosum** *Nutt.*

Canada. Alberta : Devils Head Lake, 6000 ft., *Macoun ;* slopes of Vermillion Mt., 6300 ft., *McCalla* 2163.

United States. Montana: Old Hollowtop, near Pony, 8000 ft., *Rydberg & Bessey* 4652. Washington: near the confluence of the Columbia, on the north towards Puget Sound, rare, *Douglas*; Cascade Mtns., common shrub by banks of streams and amongst woods up to 6500 ft., *Lyall*. Oregon: bogs and stream banks of the Wallowa Mtns., *Cusick* 2313; Coast Range and Willamette valley, *Moseley*. Wyoming: Spring Creek, *Nelson* 6291. California: Sierra Nevada, 5000 ft., *Lobb* 317; Silua Mtn. Pass, *Hooker & Gray*; meadows near Black Mountain, Fresno County, 9500 ft., *Hall & Chandler* 597. Long Meadow, Tulare County, 8000–9000 ft., *Palmer* 200; Scotts Mtn., 6000 ft., *Engelmann & Sargent*; near Mineral King, Sierra Nevada, *Coville & Funston* 1556.

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## XXX.—ORTHACHNE AND STREPTACHNE.

D. K. Hughes.

The first description of *Orthachne* (spalm. *Ortachne*) was published in Steudel's Synopsis Plantarum Graminearum p. 121 early in 1854* with *O. retorta* Nees ms. as the only species. Soon after that, either in 1854 or early in 1855,† Nees in Seemann's Botany of the Voyage of H.M.S. "Herald" (p. 225) mentioned the genus again, without describing it or referring to Steudel's Synopsis; but this time the species given is *O. pilosa*, a new combination for *Streptachne pilosa* H.B. & K. It is evident that both for reasons of priority and because it is accompanied by a generic description, *Orthachne retorta* Nees ex Steudel has to be regarded as the type of the genus. This *O. retorta* was based by Nees on a specimen labelled "Henslow legit ad Prom. tres montes." The specimen was, however, without doubt collected by Darwin and given to Henslow, and in the Herbarium at Kew there is actually a specimen collected by Darwin and written up by him "C. Tres Montes." It agrees in all respects with Nees's description of *Orthachne retorta*; but it is at the same time the original of *Muehlenbergia rariflora* Hook. f. (Fl. Antarct. 371, t. 131; 1847). Bentham, in Journ. Linn. Soc. xix. 81, commenting on Hooker's species moved it from *Muehlenbergia* to *Stipa*. It is, however, not a true *Stipa*, for the fertile floret is not crustaceous but is of the same texture as the empty glumes; the awn is only slightly twisted and has no distinct differentiation into column and bristle, and there are only two lodicules. It is also very different from any species at present included in *Muehlenbergia*, especially in the dwarf habit and the hard convolute leaves, the very scanty panicle which is about two inches long and in the very coarse awns.

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* *See* review in Flora xxxvii. 125; Febr. 1854.

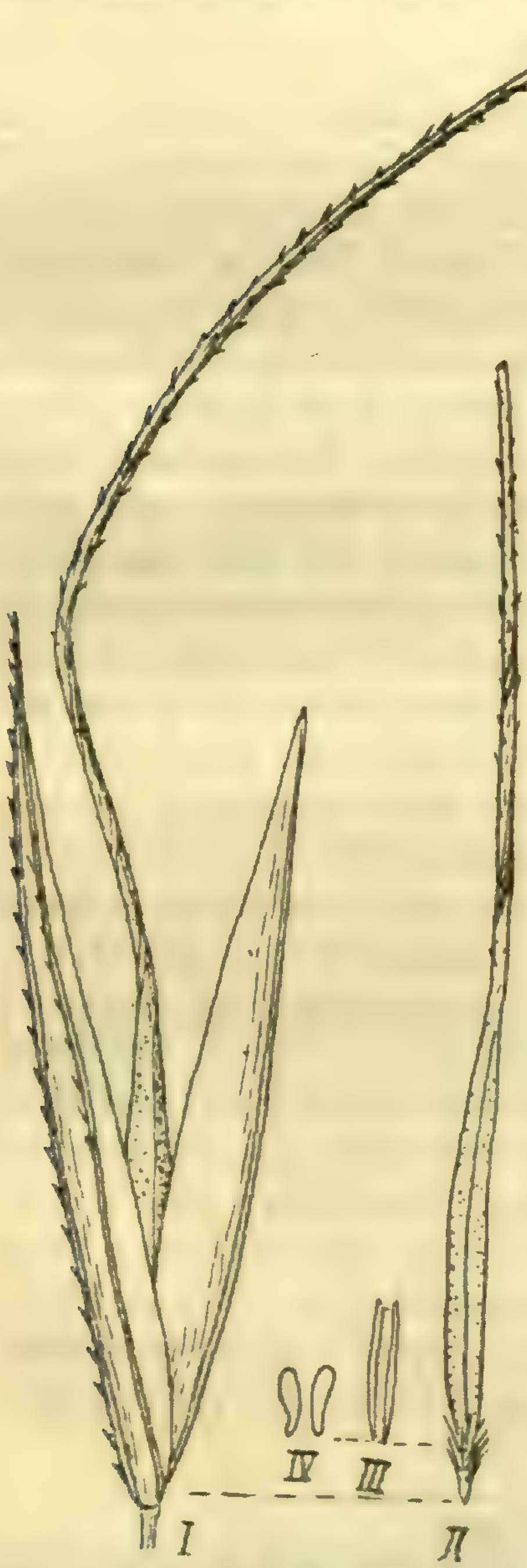
† *See* reviews—part v. (pp. 161–200) in Gard. Chron. July 29, 1854, p. 487; part vi (pp. 201–253) in Am. Journ. Sci., May 1855, p. 439; parts i–vi in Trans. Linn. Soc. xxi, 342 (1885) and mentioned as published "London 1852–4."

It seems, therefore, advisable to retain for the present the generic name given by Hooker in 1854, and to restore the trivial *rariflora* given by Hooker in 1847 for the type, which then becomes *O. rariflora*.

**Orthachne rariflora** (Hook f.) *Hughes* nov. comb.; *O. retorta* Nees in Steud. Syn. Pl. Gram. 121 (1845); *Muehlenbergia rariflora* Hook. f. Fl. Antarct. 371, t. 131 (1847); Gay. Fl. Chil. vi. 293 (1849); Kurtz in N. Alboff Contrib. Fl. Terre de Feu ii. 43 (1896); Macloskie in Scott Patag. Exped. 179 (1904) et in Suppl. 33 (1914); *Stipa rariflora* Benth, in Journ. Linn. Soc. xix. 81 (1881); Speg. Pl. per Fueg. coll. 82 (1896); Dusen in O. Nordensk. Svenska Exped. till Magell. iii. 218 (1900); E. de Wildeman, Phan. des Terres Magell. 38 (1905); Macloskie in Scott Patag. Exped. 175 (1904).

TEMPERATE S. AMERICA: Chile: Taytao Peninsula, C. Tres Montes, *Darwin*! Rio Azapardo, *Dusen* (1897); Brunswick Peninsula, Port Famine, *King*! Tierra del Fuego: Orange Harbour, *Wilkes*! Desolation Island, *Dusen* (1896); Ushnaia, *N. Alboff* 1002; Staaten Island, Port Cook, *Spegazzini* (1882).

*O. pilosa* Nees in Seemann, Bot. Voy. Herald 225, *O. scabra* and *O. tenuis* Fourn. in Bull. Soc. Bot. Fr. xxvii. 295 (1880) and *O. floridana* Nash in Small Fl. S. E. U. St. 119 (1903) belong to the section of *Aristida* in which the lateral awns are suppressed.




*Streptachne stipoides*: I, spikelet; II, fertile floret; III, valvule of fertile floret; IV, lodicules; all x 3.

The genus *Streptachne* was first described by Robert Brown in Prodr. Fl. Nov. Holl. p. 174 (1810). His only species, *S. stipoides*, was based on a specimen collected by Banks and Solander on the Endeavour River, Queensland, and now in the British Museum. It consists of two inflorescences with no base or leaves. In general appearance it is very similar to *Stipa*, but differs from that genus in the awn being continuous with the fertile valve with no suggestion of an articulation, and in there being only two lodicules. The valve is hairy on the callous only, and

is minutely scaberulous upwards, and the valvule is much reduced as in § *Micropaleatae* of *Stipa* and in some groups of *Aristida*.

Since then about nine species have been referred to that genus, but none of them can be considered as congeneric with the type of *Streptachne*. In 1815 Kunth, in H. B. & K. Nov. Gen. et Spec. i. p. 124, added three new species from Mexico, *S. scabra*, *S. pilosa* and *S. tenuis*, which are now recognised as belonging to the section of *Aristida* in which the lateral awns are suppressed. To the same group belong also *S. cubensis* A. Rich., Fl. Cub. Fan. ii. 311 (1853) and *S. floridana* Champ., Fl. S. U. St. 554 (1860). *S. verticillata* and *S. ramosissima*, Trin. & Rupr. in Mem. Acad. Petersb. Ser. vi. Sc. Nat. v. p. 7 (1842), have no close relationship with *Streptachne* but are allied rather to *Muehlenbergia* (not *Dichelachne* as stated in Kew Bull. 1921 p. 28). *S. domingensis* Spreng. ex Schult. Mant. ii. 188 (1817), is a synonym of *Andropogon hirtiflorus* Kunth; and *S. Calamagrostis* Dum. Obs. Gram. Belg. 135, is *Stipa Calamagrostis* Whlbg.

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## XXXI.—MISCELLANEOUS NOTES.

Captain R. F. Martin, B.Sc. (Agric.) and Mr. A. G. G. Hill have been appointed by the Secretary of State for the Colonies on the recommendation of Kew, Superintendents, Agricultural Department, Nigeria.

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**Indian Species of Eriocaulon.***—The very complete account of the Indian species of *Eriocaulon* by Prof. P. F. Fyson, which originally appeared in volumes II. and III. of the Journal of Indian Botany, has now been issued in the convenient form of a book containing 88 pages and 51 plates and numerous text figures. Fourteen pages are devoted to a general description of the plants and a discussion on the relative values of the various organs for specific diagnosis. This is followed by detailed descriptions of 51 species, 10 of which are described for the first time, in addition to which 12 others previously recorded from India remain doubtful. The numerous figures depict not only the habit of the plants, but floral dissections which are so essential in separating the species in a genus where they differ chiefly in their floral characters. The book forms a valuable addition to the literature of Indian Botany. C. H. W.

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**Northern Trees in Southern Lands.**—This article, issued as a reprint, originally appeared in vol. iv. of the Journal of the Arnold Arboretum. It is from the pen of Mr. E. H. Wilson, Assistant Director of the Arnold Arboretum, and is descriptive of various prominent features noted during his recent tour through

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* The Indian Species of *Eriocaulon*. By P. F. Fyson, M.A., F.L.S. Madras. Methodist Publishing House, 1923.

Australia, Tasmania, New Zealand, and South Africa. After a brief description of some of the principal features of native vegetation he deals more exhaustively with the growth of trees introduced from the northern hemisphere. The most important introduced trees appear to be Conifers, of which *Pinus radiata*, *P. Pinaster* and *P. canariensis* are of great promise in many places, while other species are locally successful. In South Africa various Mexican Pines are giving good results as are several species of *Cupressus*. In Australasia *Cupressus macrocarpa* grows excellently whilst various species of *Cedrus* and *Larix* are a success in selected areas. Species of *Picea*, *Abies* and *Tsuga* appear to be unsatisfactory. Extraordinary results have been obtained in Australia, New Zealand and South Africa by planting *Pinus radiata* (*P. insignis*) under forest conditions. A grove felled during Mr. Wilson's visit in 1921 was planted 40 years earlier on St. Leonard's Farm, near Hammer Springs, Canterbury, New Zealand. The trees were from 100 to 115 ft. in height by 11 to 15 ft. in girth, they averaged 800 board ft. of timber and some of the larger ones yielded 1000 board ft. In South Africa he was shown trees at the forest station at Tokai which were 33 years old, 138 ft. tall and 10 ft. in girth. Two stands had been felled at 29 years of age and yielded respectively 7972 and 7721 cubic ft. of timber per acre. At 40 years of age a fully-stocked wood of this pine is estimated to yield from 10,000 to 12,000 cubic ft. of timber per acre. The timber produced in the southern hemisphere is stated to be superior to that produced in its native country, California. Introduced hardwood trees appear to be less satisfactory in each country than Conifers, although various species of *Quercus* succeed in South Africa.

W. D.

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

No. 9] [1923

## XXXII.—THE GENUS PANICUM OF THE FLORA AUSTRALIENSIS.

D. K. Hughes.

When the *Paniceae* were revised by Dr. O. Stapf for the Flora of Tropical Africa, he recognised, as do most modern authors, the expediency of adopting smaller genera with well-defined limits, rather than retaining them as groups of the enormous and unwieldy genus *Panicum*. The arrangement in the Kew Herbarium of the African material on these lines also entailed the examination of similar groups from other parts of the world. The group affording the greatest difficulty, perhaps, consisted of all the species enumerated under *Panicum* by Bentham in the Flora Australiensis. Since that great work was published, further collections have been added to the Herbarium. Of these, much material was incorrectly or only partially named and the morphology incompletely studied, and much was new.

The work given here, which is an outline of a more extensive paper intended for later publication, contains an enumeration of all the specimens of the group at present in the Kew Herbarium and at the British Museum, with Keys to the genera and species based, as far as possible, on fundamental characters. Numerous notes have been made on morphology, literature and geographical distribution, but these, together with drawings of the types, are being held over until the writer has had an opportunity of amplifying them during a forthcoming visit to some of the Herbaria in the United States.

It must be remembered that the group under consideration is limited strictly to *Panicum* as understood by Bentham, and that allied plants which he placed in other genera are not considered here. The Key, as a synopsis of the Australian Genera of *Paniceae*, is therefore incomplete, and the sequence of the genera not exactly in accordance with their true taxonomic relationship. Thus, for instance, the genus *Paractaenum* is placed in the Key after *Echinochloa*, but its true affinity is with

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*Plagiosetum* in the *Cenchrastrae*, a genus already recognised as distinct in the Flora Australiensis, and therefore not included in the Key. Two species have been moved from *Paspalum* to *Digitaria*, viz. *Paspalum brevifolium* Fluegge to *Digitaria longiflora* Pers. and *Paspalum minutiflorum* Benth. non Steud. to *Digitaria recta* Hughes, as the account of *Digitaria* would not have been complete had these two species been omitted.

## Key to the Genera.

Fertile floret glabrous, smooth and shining or rugose :

*Fruiting valve cartilaginous indurated or crustaceous; inflorescence an open panicle or composed of simple or compound racemes :

Fruiting valve with usually flat, thin to hyaline margins, thinly cartilaginous, with the usually minute, often microscopic, scale-like valvule of the barren floret attached to its base :

Inflorescence of digitate or subdigitate (rarely solitary) racemes, these longer than the main axis :

Spikelets, including the fertile valve, awned; racemes stout - I. **Alloteropsis.**

Spikelets awnless; racemes slender II. **Digitaria.**

Inflorescence an open panicle - III. **Leptoloma.**

Fruiting valve with more or less inrolled margins, usually crustaceous; valvule of the barren floret, if developed, not attached to the false fruit :

Inflorescence of racemosely arranged simple or compound racemes :

Back of fruit abaxial - - IV. **Brachiaria.**

Back of fruit adaxial :

Rhachis of racemes persistent on the main axis; spikelets falling off singly :

Glumes neither awned nor caudate, or if shortly cuspidate acuminate, then the fruiting valve obtuse with an imposed mucro and the margins inrolled all along :

Fruiting valve acute or acuminate, not mucronate; spikelets sometimes subtended by a bristle, or the racemes often ending in a bristle - - - V. **Paspalidium.**

Fruiting valve obtuse, abruptly mucronate or aristulate; inflorescence without bristles - - VI. **Urochloa.**

Glumes caudate, or cuspidate acuminate, or awned; margins of the fruiting valve flat upwards, not embracing the tip of the valvule - - VII. **Echinochloa.**

Racemes disarticulating at the base from the main axis and falling off with the spikelets - VIII. **Paractaenum.**

Inflorescence an open panicle or contracted and spikelike:

Spikelets not gibbous; inflorescence an open panicle:

Fertile floret without any basal appendages - - - IX. **Panicum.**

Fertile floret with basal appendages in front - - - X. **Ichnanthus.**

Spikelets gibbous:

Spikelets in panicles; fertile floret laterally much compressed XI. **Cyrtococcum.**

Spikelets in cylindrical false spikes; fertile floret not distinctly laterally compressed - XII. **Sacciolepis.**

**Fruiting valve membranous; inflorescence a dense contracted and often spikelike panicle - - - XIII. **Hymenachne.**

Fertile floret distinctly villous or villosulous, cartilaginous or membranous - - - XIV. **Entolasia.**

## Enumeration.

(A mark ! denotes the type of the Species.)

I. **Alloteropsis** *Presl.* emend. *Hitchc.* in Contrib. U. S. Nat. Herb. xii. 210 (1909).

**A. semialata** (*R. Br.*) *Hitchc.* l.c.; *Panicum semialatum* R. Br. Prod. 192 (1810); Benth. Fl. Austral. vii. 472; *P. viaticum* Griff. Ic. Pl. As. t. 145 (1851), f. 2; *Urochloa semialata* Kunth. Rev. Gram. i. 31 (1839); *Oplismenus semialatus* Desv. Opusc. 81 (1831); *Coridochloa semialatus* Nees in Edinb. New Phil. Journ. xv, 31 (1833); *Aira viatica* Griff. Not. iii. 54 (1851); *Holosetum philippicum* Steud. Syn. Pl. Glum. 118 (1854); *Arundinella Schultzii* Benth. Fl. Austral. vii. 545 (1878).

W. Australia: Escape Cliffs, *Hulse.*

N. Territory: Victoria River, *Mueller*; Port Darwin, *Schultz* 31, 662, 784, 801; near Darwin, *Allen* 10, 47, 70, 162,

163; Carpentaria, *Brown*!; Port Essington, *Armstrong* 510, 546; between Providence Hill and McAdam Range, *Mueller*.

QUEENSLAND: Sweers Island, *Henne*; Rockingham Bay, *Dallachy*; Herbert's Creek, *Bowman*; Keppel Bay, *Brown*!; Port Curtis, *McGillivray*; Moreton Island, *McGillivray*; and without precise locality, *Leichhardt*.

N.S. WALES: near Richmond River, *Strange*; Clarence River, *Strange*; Liverpool Plains and Endeavour River, *Cunningham*; Warialda, *Hadley*.

II. **Digitaria** *Hall.* Hist. Stirp. ii. 244 (1768).

*Racemes sessile or subsessile, or if bare at the base, then with traces of arrested spikelets:

Spikelets sparingly pubescent or glabrous:

Rhachis of racemes stout, laterally winged or margined; spikelets 4–4·8 mm. long, these, or at least the upper of each pair, with coarse, rigid, tubercle-based hairs on the lateral nerves of the lower floret:

Racemes 2, about 8 cm. long; spikelets 4·5–4·8 mm. long; culms weak; plants up to about 30 cm. high - - - - 1. *ctenantha*.

Racemes 3 or more, 16–18 cm. long; spikelets 4 mm. long; culms robust; plants 50 cm. or more high - 2. *robusta*.

Rhachis of racemes slender to filiform; spikelets 1·5–3·5 mm. long; hairs different:

Upper glume 5-nerved, equalling the spikelet in shape and size:

Lower glume minute or obsolete:

Racemes 2–3, approximate, slender, flexuose, up to 12 cm. long; spikelets pale and finely pubescent - - - 3. *longiflora*.

Racemes several, spreading, 3–7 cm. long; spikelets dark, apparently glabrous - - 4. *striata*.

Lower glume larger, about 6 mm. long:

Spikelets 2 mm. long, glabrous 5. *parviflora*.

Spikelets 2·5 mm. long, softly pubescent - - - 6. *Baileyi*.

Upper glume usually 3-nerved, slightly or conspicuously shorter and narrower than the spikelet:

Upper glume narrow, lanceolate or ovate-lanceolate, 3-nerved, equalling more than half the length of the spikelet :

Spikelets 2·7–3·5 mm. long :

Lateral nerves of the lower valve gathered to the margins, leaving a wider space on either side of the middle nerve; racemes usually numerous; plants coarsely hirsute :

Spikelets acuminate, glabrous or pubescent; nerves of the lower valve smooth — 7. *marginata.*

Spikelets acute or rather less acuminate than in *D. marginata*; nerves of the lower floret scabrid or scaberulous - - — 8. *sanguinalis.*

Nerves of the lower valve closely and evenly distributed; racemes 2–3; plants slender, glabrous - - — 9. *stenostachya.*

Spikelets 1·5–2 mm. long :

Culms about 3-noded; leaves lanceolate, flat, up to 15 cm. long; racemes several, 5–12 cm. long - - - - — 10. *recta.*

Culms many-noded; leaves crowded, about 2–3 cm. long; racemes 2–4, 3–5 cm. long :

Racemes usually 2; spikelets 2 mm. long - - — 11. *didactyla.*

Racemes 3–4; spikelets 1·5 mm. long - - — 12. *tenuissima.*

Upper glume broad, rotundate, equalling about half, or less, the length of the spikelet, nerveless or the middle nerve obsolete :

Lower valve 7-nerved; upper glume 6 mm. long - - — 13. *diminuta.*

Lower valve 3-nerved; upper glume quite rudimentary - — 14. *orbata.*

Spikelets densely hairy; indumentum usually much exceeding the spikelets :

Spikelets gibbous; hairs coarse, rigid, needle-like - - - - — 15. *gibbosa.*

Spikelets not gibbous; hairs very fine, soft and woolly - - - — 16. *Brownei.*

**Racemes bare at the base for at least 3 cm. (often for 10 or 12 cm.), the lowest whorled :

Spikelets 2–2·5 mm. long :
Spikelets clothed with long silky hairs up to 2 mm. long - - - 17. *ammophila.*
Spikelets glabrous - - - 18. *tonsa.*

Spikelets 3·5–4·5 mm. long :
Spikelets softly pubescent or glabrous :
Leaves and sheaths woolly pubescent; upper glume as long as the spikelet - - 19. *coenicola.*
Leaves and sheaths more or less glabrous or glabrescent; upper glume often slightly shorter and narrower than the spikelet - 20. *divaricatissima.*
Spikelets with tubercle-based hairs along the nerves of the lower valve - 21. *macractenia.*

1. **D. ctenantha** (*F. Muell.*) *Hughes* nov. comb.; *Panicum ctenanthum* F. Muell. Fragm. vii. 153 (1874); Benth. Fl. Austral. vii. 469.

W. Australia : Dampier's Archipelago, *Walcot ;* Mons Cupri, Whim Creek, *Mitchell ;* Sturt's Creek, *Mueller.*

2. **D. robusta** *Hughes* nov. sp.

*Annua,* usque ad 60 cm. alta inflorescentia inclusa. *Culmi* erecti vel geniculato-ascendentes, multinodi nodis exsertis glabris inferioribus radicantibus. *Foliorum* vaginae solutae, glabrae, ore longe barbatae ; ligulae ovatae, membranaceae, 1·5 mm. longae, glabrae; laminae planae, circiter 12 cm. longae, 0·4 cm. latae, glabrae vel pilis paucis tenuissimis basi tuberculatis indutae. *Racemi* 3, digitati, usque ad 20 cm. longi; rhachis breviter alata, 0·8 mm. lata. *Spiculae* 2-nae, 4 mm. longae, anguste ovato-oblongae. *Gluma* inferior nulla; superior 3 mm. longa, ovata, acuta, sericeo-hirsuta. *Anthoecium* inferum ad valvam spiculam aequantem 5-nervem reductum nervis lateralibus ciliis rigidis basi tuberculatis indutis. *Anthoecium* superum ♂, anguste ovato-oblongum, albidum.

N. Territory : Melville Island "sandy soil near beach", *Hill* 189 !.

3. **D. longiflora** (*Retz.*) *Pers.* Syn. i. 85 (1805); *D. tenuiflora* Beauv. Agrost. 51 (1812); *D. Pseudo-Durva* Nees, Fl. Afr. Austr. 21 (1841); *Paspalum longiflorum* Retz. Obs. iv. 15 (1786); *P. brevifolium* Fluegge Monogr. 150 (1810); Benth. Fl. Austral. vii. 461; *Panicum tenuiflorum* R. Br. Prod. 193 (1810); *P. propinquum* R. Br. l. c.; *P. Steudelianum* Domin in Biblioth. Bot. lxxxv. 296 (1915); *Syntherisma longiflora* Skeels in U.S. Dep. Agric. Bur. Pl. Ind. Bull. 261. 30 (1912).

N. Territory : McAdam Range, *Mueller.*

QUEENSLAND : Rockingham Bay, *Dallachy*; Herbert's Creek, *Bowman*.

N. S. WALES : Port Jackson, *Brown* 6122, 6123.

4. **D. striata** (*R. Br.*) *Hughes* nov. comb.; *Panicum striatum* R. Br. Prod. 192 (1810); *P. australe* Spreng. Syst. Veg. i. 309 (1825); *P. parviflorum* Benth. Fl. Austral. vii. 471 (1878) p.p. non R. Br.; *P. Steudelianum* var. *striatum* Domin in Biblioth. Bot. lxxxv. 296 (1915).

N. S. WALES : Port Jackson, *Brown* 6116 !.

5. **D. parviflora** (*R. Br.*) *Hughes* nov. comb.; *Panicum parviflorum* R. Br. Prod. 192 (1810); Benth. Fl. Austral. 470.

QUEENSLAND : Brisbane River, *Mueller*.

N. S. WALES : McIntyre River, *Ker*; New England, *Stuart*; Parramatta, *Woolls*; Port Jackson, *Brown* 6117 !; and without precise locality, *Mueller*, *Leichhardt*.

6. **D. Baileyi** (*Benth.*) *Hughes* nov. comb.; *Panicum Baileyi* Benth. Fl. Austral. vii. 471 (1878).

QUEENSLAND : Brisbane River, *Bailey* !.

N. S. WALES : Port Jackson, *Brown* 6119 p.p. (mixed with *P. villosum* R. Br. type).

7. **D. marginata** *Link* Hort. Berol. i. 229 (1827); *Panicum sanguinale* Benth. Fl. Austral. vii. 469 (1878) p.p.

W. AUSTRALIA : Leederville, *Stoward* 937; Busselton, *Preis*.

N. TERRITORY : Port Essington, *Armstrong* 593.

QUEENSLAND : Rockhampton, *O'Shanesy*; Brisbane River, *Mueller*.

N. S. WALES : McIntyre River, *Ker* p.p.; New England, Clifton, *Stuart*.

8. **D. sanguinalis** (*Linn.*) *Scop*. Fl. Carn. ed. ii. i. 52 (1772); *Panicum sanguinalis* Linn. Sp. Pl. 57 (1753); Benth. Fl. Austral. vii. 469 p.p.

W. AUSTRALIA : Claremont near Perth, *Andrews* 1188.

N. S. WALES : McIntyre River, *Ker*; Sydney, *McStephenson* 259.

9. **D. stenostachya** (*Benth.*) *Hughes* nov. comb.; *Panicum stenostachyum* Benth. Fl. Austral. vii. 470 (1878).

N. TERRITORY : Upper Victoria River, *Mueller*.

10. **D. recta** *Hughes* nov. sp.

*Annua* (?), usque ad 60 cm. alta inflorescentia inclusa. *Culmi* erecti vel geniculato-ascendentes, 3-nodi nodis glabris. *Foliorum* vaginae subapertae, glabrae; ligulae membranaceae, truncatae, 1 mm. longae; laminae planae, usque ad 15 cm. longae, 0·4—0·6

cm. latae, glabrae vel basi pilos paucos elongatos gerentes. *Racemi* usque ad 7, alterni vel subdigitati, recti, usque ad 13 cm. longi; rhachis 0·8 mm. lata. *Spiculae* biseriatae, breviter pedicellatae pedicellis persistentibus, ovatae, acutae, 2 mm. longae, glabrae. *Gluma* inferior nulla; superior 3-nervis, spicula paulo minor. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovatum, acutum, nitidum, brunnescens.—*Paspalum minutiflorum* Benth. Fl. Austral. vii. 461 (1878), non Steud.

QUEENSLAND: Port Curtis, *McGillivray*.

11. **D. didactyla** *Willd.* Enum. Hort. Berol. 91 (1809); Stapf in Kew Bull. 1911, 256; *Panicum gracile* Nees in Spreng. Syst. Veg. iv, ii. 33 (1827) non R. Br.; *P. subtile* Nees in Flora 1828, 300 (nomen); *P. didactylum* Kunth Rév. Gram. 33 (1839); *P. bicorne* Sieb. ex Steud. Syn. Pl. Gram. 41 (1854) non Kunth.

N. S. WALES: Port Jackson, *Sieber Agrostoth.* 72; Sydney, *Maiden*.

12. **D. tenuissima** (*Benth.*) *Hughes* nov. comb.; *Panicum tenuissimum* Benth. Fl. Austral. vii. 470 (1878).

QUEENSLAND: Rockhampton, *O'Shanesy*; Brisbane River, *Mueller*.

13. **D. diminuta** *Hughes* nov. sp.

*Perennis*, caespitosa usque ad 35 cm. alta inflorescentia inclusa. *Culmi* erecti, 2-nodi nodis pubescentibus vel glabrescentibus. *Foliorum* vaginae subapertae, innovationum hirsutae, caeterum glabrescentes; ligulae membranaceae, integrae, usque ad 2 mm. longae; laminae lineares, planae vel laxe convolutae, 4–12 cm. longae, 0·2 cm. latae, glabrae, utrinque leviter scaberulae. *Racemi* 5, alterni, 4–8 cm. longi. *Spiculae* 2-nae, ovatae, 1·7 mm. longae, glabrae. *Glumae* reductae, rotundato-ovatae; inferior minutissima; superior sub 2-nervis, 0·6 mm. longa. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovatum, 1·7 mm. longum, tenuissime pruinosum, brunnescens.

N. S. WALES: McIntyre River, *Ker* !.

14. **D. orbata** *Hughes* nov. sp.

*Perennis*, usque ad 45 cm. alta inflorescentia inclusa. *Culmi* erecti, graciles, 2-nodi nodis exsertis glabris. *Foliorum* vaginae subapertae, innovationum dense sericeo-hirsutae, caeterum glabrescentes; ligulae membranaceae, usque ad 1·5 mm. longae; laminae lineares, planae, 6–11 cm. longae, 0·2–0·3 cm. latae, glabrae. *Racemi* subdigitati, 3–7, undulati, usque ad 8 cm. longi. *Spiculae* 2-nae, ovatae, 1·5 mm. longae, glabrae. *Glumae* valde redactae; inferior nulla, superior minutissima, enervis. *Anthoecium* inferum ad valvam 3-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovatum, apiculatum, 1·5 mm. longum, tenuissime pruinosum.

QUEENSLAND : Herbert's Creek, *Bowman* !.

15. **D. gibbosa** (*R. Br.*) *Beauv.* Agrost. 160 (1812); *D. orthostachya* Stapf & Jesson in Kew Bull. 1915, 93; *Panicum gibbosum* R. Br. Prod. 193 (1810); Benth. Fl. Austral. vii, 471. *P. orthostachyum* Ewart & Davies, Fl. N. Terr. 38 (1917).

N. TERRITORY : Victoria River, *Mueller*; near Darwin, *Allen* 29, 143; Port Essington, *Armstrong* 589.

QUEENSLAND : Port Curtis, *McGillivray*; Rockhampton, *O'Shanesy*; Keppel Bay, *Brown* 6124 !; and without precise locality, *Mueller*.

16. **D. Brownei** (*R. & S.*) *Hughes* nov. comb.; *Panicum villosum* R. Br. Prod. 192 (1810) non Lam.; *P. Brownei* Roem. & Schult. Syst. ii. 462 (1817); *P. glareae* F. Muell. in Linnaea xxv, 445 (1852); *P. laniflorum* Nees in Hook. Lond. Journ. ii. 410 (1843); *P. leucophaeum* Benth. Fl. Austral. vii. 472 (1878), non H. B. & K.

W. AUSTRALIA : Hunter's River, *Wilkes*.

QUEENSLAND : Rockingham Bay, *Dallachy*; Port Curtis, *McGillivray*; Shoalwater and Keppel Bays, *Brown* 6119 !.

N. S. WALES : Darling River, *Dallachy*; McIntyre River, *Ker*; Endeavour River, *Banks* and *Solander*; Lachlan River, *Fraser* 19, 20; New England, *Stuart*; Clarence River, *Beckler*; Port Jackson, *Brown* 6119 !; Mount Goningberi, *Victorian Expedition*; and without precise locality, *Cunningham*, *Caley*, *Mitchell* 68.

var. **monostachya** *Hughes* nov. comb.; *Panicum leucophaeum*, var. *monostachyum*, Benth. Fl. Austral. vii. 472 (1878).

Raceme 1.

W. AUSTRALIA : *Drummond*.

N. S. WALES (?) : Goyinga Mts., *Victorian Expedition*.

17. **D. ammophila** (*F. Muell.*) *Hughes* nov. comb.; *Panicum ammophilum* F. Muell. in Trans. Vict. Inst. 1855, 46; *P. divaricatissimum* var. *ammophilum* Benth. Fl. Austral. vii. 468 (1878).

W. AUSTRALIA : Transcontinental Railway Line, East of Coolgardie, *Stoward* 140.

N. S. WALES : near Menindee, *Victorian Expedition*; Mt. Goningberi, *Victorian Expedition*; Murray and Murrimbidgee Rivers, *Mueller* !.

18. **D. tonsa** *Hughes* nov. nom.; *Panicum radiatum* R. Br. Prod. 192 (1810); *P. divaricatissimum* var. *radiatum* Benth. Fl. Austral. vii. 468 (1878).

N. S. WALES : Port Jackson, *Brown* !.

19. **D. coenicola** (*F. Muell.*) *Hughes* nov. comb.; *Panicum coenicolum* F. Muell. in Trans. Vict. Inst. 1855, 45; Benth. Fl. Austral. vii. 467 (1878); *Leptoloma coenicola* Chase in Proc. Biol. Soc. Wash. xix. 192 (1906).

W. AUSTRALIA : Fraser's Range, *Dempster*; and without precise locality, *Drummond*.

N. Territory : Lake Amadeus, *Giles*.

S. Australia : Cudnaka, *Mueller* !; Muda, *Mitchell*; near Lake Eyre, *Andrews*; and without precise locality, *Stuart*.

N. S. Wales : Murrimbidgee River, *Mueller*.

20. **D. divaricatissima** (*R. Br.*) *Hughes* nov. comb.; *Panicum divaricatissimum* R. Br. Prod. 192 (1810); *P. divaricatissimum* var. *glaberrimum* Benth. Fl. Austral. vii. 468 (1878); *P. divaricatissimum* var. *normale* Benth. l. c.; *Leptoloma divaricatissima* Chase in Proc. Biol. Soc. Wash. xix. 192 (1906).

Queensland : Peak Downs, *Burkitt*.

N. S. Wales : Boggy Plains of the Lachlan River, *Mueller*; Keppel Bay and Port Jackson, *Brown* 6118 !.

21. **D. macractenia** (*Benth.*) *Hughes* nov. comb.; *Panicum macractenium* Benth. Fl. Austral. vii. 468 (1878); *Leptoloma macractenia* Chase in Proc. Biol. Soc. Wash. xix. 192 (1906).

Queensland : Herbert's Creek, *Bowman* !.

N. S. Wales : Endeavour River, *Banks* and *Solander*.

III. **Leptoloma** *Chase* in Proc. Biol. Soc. Wash. xix. 192 (1906).

**L. papposa** (*R. Br.*) *Hughes* nov. comb.; *Panicum papposum* R. Br. Prod. 192 (1810); Benth. Fl. Austral. vii. 468.

N. Territory : Arnhem South Bay, *Brown* 6120 !.

IV. **Brachiaria** *Griseb.* in Ledeb. Fl. Ross. iv. 469 (1853).

Spikelets with a silky, transverse, apical fringe :
- Lower valve aristulate; upper valve rugose and mucronate - - - - - - 1. *holosericea*.
- Valves neither aristulate nor mucronate - 2. *argentea*.

Spikelets glabrous, or shortly pubescent, but with no distinct fringe :
- Rachis more or less triquetrous or filiform; lower valvule developed :
  - Spikelets 3·5–4 mm. long; upper glume and lower valve usually 5-nerved :
    - Lower glume $\frac{2}{3}$ or more the length of the spikelet; lower valvule as long as its valve; spikelets pubescent - - - 3. *ramosa*.
    - Lower glume $\frac{1}{2}$ or less the length of the spikelet; lower valvule about $\frac{1}{3}$ as long as its valve; spikelets glabrous - - 4. *polyphylla*.
  - Spikelets 5–6 mm. long; upper glume and lower valve usually 9-nerved - - - 5. *foliosa*.
- Rachis more or less flat and ribbon like, 0·5–1 mm. wide; lower valvule obsolete :
  - Spikelets 5 mm. long, pubescent or with a small tuft of hairs at the apex - - 6. *piligera*.
  - Spikelets 4 mm. long, glabrous - - - 7. *distachya*.

1. **B. holosericea** (*R.Br.*) *Hughes* nov. comb.; *Panicum holosericeum* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 473.

N. Territory: Port Darwin, *Schultz* 14, 113, 830; near Darwin, Pine Creek, *Allen* 111; Arnhem's Land, *McKinlay*; Gulf of Carpentaria, *Brown* 6094!; Victoria River, *Mueller*; near King's Sound, *Poulton*.

Queensland: Thursday Island, *Podenzana*.

2. **B. argentea** (*R.Br.*) *Hughes* nov. comb.; *Panicum argenteum* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 473.

N. Territory: Gulf of Carpentaria, *Brown* 6095!.

3. **B. ramosa** *Stapf* var. **grandiflora** *Hughes* nov. nom.; *Panicum pubescens* R. Br. Prod. 190 (1810); *P. helopus* var. *glabrior* Benth. Fl. Austral. vii. 476 (1878).

N. Territory: Gulf of Carpentaria, *Brown* 6111!; Lower Victoria River, *Mueller*.

4. **B. polyphylla** (*R.Br.*) *Hughes* nov. comb.; *Panicum polyphyllum* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 477.

N. Territory: Port Darwin, *Schultz* 34, 818; near Darwin, *Allen* 31; Port Essington, *Armstrong* 591; Gulf of Carpentaria, *Brown* 6093!.

5. **B. foliosa** (*R.Br.*) *Hughes* nov. comb.; *Panicum foliosum* R. Br. Prod. 191 (1810); Benth. Fl. Austral. vii. 481.

Queensland: Rockhampton, *Thozet*; Keppel Bay, *Brown* 6110!; Moreton Bay, *Stuart*; Brisbane River, *Mueller*.

N. S. Wales: McIntyre River, *Ker*; Brisbane and Endeavour Rivers, *Banks* and *Solander*; Hunter's River, *Caley*.

6. **B. piligera** (*F. Muell.*) *Hughes* nov. comb.; *Panicum piligerum* F. Muell. ex Benth. Fl. Austral. vii. 477 (1878).

N. Territory: Victoria River, *Mueller*!.

var. **intercedens** *Hughes* nov. comb.; *Panicum intercedens* Domin in Journ. Linn. Soc. 1912, 271.

Leaves more or less glabrous and, in the Ashburton River specimens, shorter; otherwise it does not differ from the type. The spikelets are identical.

W. Australia: Between the Ashburton and De Gray Rivers, *Clement*!; in the bed of the Ashburton River, Minderoo, *Morrison*.

N. S. Wales: Warialda, *Hadley*.

7. **B. distachya** (*Linn.*) *A. Camus* Fl. Indo-Chine, vii. 437 (1922); *Panicum distachyum* Linn. Mant. i. 138 (1767); *Digitaria distachya* Pers. i. 85 (1805).

W. Australia: Wallal Country about 100 miles E. of Condon, *Taylor* 232; and without precise localities, *Mueller*, *Stoward*.

S. Australia: Vicinity of Lake Eyre, *Andrews* 31; and without precise locality, *Gosse's Expedition* 169; Great Plains, *Mitchell*.

Queensland: Rockhampton, *O'Shanesy*.

**V. Paspalidium** *Stapf* in Prain Fl. Trop. Afr. ix. 582 (1920).

Spikelets with stiff tubercle-based hairs along the nerves of the lower and upper glumes; lower floret deeply grooved on the back (see also *P. inaequale*) - - - - - - - 1. *semitonsum*.

Spikelets with no such hairs; lower floret not grooved on the back (except in *P. inaequale*):

Nerves of the upper glume 13–15, anastomosing for at least some distance below the tip; fertile floret much curved in profile:

Glumes strongly inrolled at the tip; lower valve grooved on the back and much exceeding the upper glume in length - - - - - - 2. *inaequale*.

Glumes not inrolled at the tip; lower valve convex on the back and as long as or slightly longer than the upper glume:

Spikelets ovate in profile; nerves anastomosing to the base of the upper glume and of the lower valve - - 3. *retiglume*.

Spikelets gibbous; nerves anastomosing for a short distance only below the tips of the upper glume and lower valve - - - - - - 4. *globoideum*.

Nerves of the upper glume 5–9, if anastomosing, then only at the very tip; fertile floret not distinctly curved in profile (but see *P. distans*):

Racemes of several spikelets:

Spikelets approximate and very evenly arranged in two close rows in racemes which are seldom branched:

Racemes many flowered, usually 2–4 cm. long, equalling or exceeding the internodes of the long stout main axis; culms rather stout - 5. *jubiflorum*.

Racemes scanty and few flowered, about 1 cm. long, much exceeded by the internodes of the very slender axis; culms weak - - - - 6. *distans*.

Spikelets irregularly arranged in loose racemes which are often branched at the base:

Spikelets loosely disposed in long racemes, not clustered; lower glume

| | |
|---|---|
| $\frac{2}{3}$ the length of the spikelet; upper glume as long as the spikelet - | 7. *basicladum*. |
| Spikelets somewhat clustered, at least at the base of the very short racemes; lower glume $\frac{1}{2}$ the length of the spikelet; upper glume slightly shorter than the spikelet - - | 8. *gracile*. |
| Racemes reduced to 1 or, in the lowest, to 2 spikelets, each supported by a bristle | 9. *rarum*. |

1. **P. semitonsum** (*F. Muell.*) *Hughes* nov. comb.; *Panicum semitonsum* F. Muell. ex Benth. Fl. Austral. vii. 483 (1878).

N. Territory: Victoria River, *Elsey*!.

2. **P. inaequale** (*F. Muell.*) *Hughes* nov. comb.; *Panicum inaequale* F. Muell. Fragm. viii. 189 (1874); Benth. Fl. Austral. vii. 482.

Queensland: Dawson River, *Mueller*!; Herbert's Creek, *Bowman*.

3. **P. retiglume** (*Domin*) *Hughes* nov. comb.; *Panicum retiglume* Domin in Fedde, Repert. Nov. Sp. x. 119 (1911).

N. Territory: Upper Victoria River, *Mueller*!.

4. **P. globoideum** (*Domin*) *Hughes* nov. comb.; *Panicum globoideum* Domin in Fedde, Repert. Nov. Sp. x. 119 (1911).

Queensland: Peak Downs, *Mueller*; Emerald, *Soutter*; Springsure, *Wuth*!; Herbert's Creek, *Bowman*; Clifton, Darby Downs, *White*.

5. **P. jubiflorum** (*Trin.*) *Hughes* nov. comb.; *Panicum jubiflorum* Trin. Gram. Pan. Diss. ii. 150 (1826); *P. flavidum* Benth. Fl. Austral. vii. 474 (1878), p.p. non Retz; *P. flavidum* var. *tenuior* Benth. l.c. p.p.; *P. gracile* Benth. l.c. p.p. non R. Br.

W. Australia: Swan River, *Drummond* 399.

Queensland: Tarampa, *Bailey*; and without precise locality, *Brown* 6097.

N. S. Wales: Warwick, *Beckler*; Ravensworth near Singleton, *Gelling*; Murray River, *Mueller*; lower Darling River, *Mrs. Ford*; Zara via Hay, "*E. Officer*"; and without precise localities, *Mitchell*, *McDougal Stuart* 189, *Giles*.

6. **P. distans** (*Trin.*) *Hughes* nov. comb.; *Panicum distans* Trin. Spec. Gram. t. 172 (1829); *P. gracile* Benth. Fl. Austral. vii. 475 (1878) p.p. non R. Br.; *P. flavidum* var. *jubiflorum* Domin in Biblioth. Bot. lxxxv. 300 (1915).

N. Territory: Port Essington, *Armstrong* 592.

Queensland: Dunk Island, *McGillivray*; Rockingham Bay, *Dallachy*; Herbert's Creek, *Bowman*; and without precise locality, *Leichhardt*; Brisbane Botanic Gardens, *White*.

N. S. Wales: Port Jackson, *Brown* 6098; Endeavour River, *Banks* and *Solander*.

7. **P. basicladum** *Hughes* nov. sp.

*Annua*, usque ad 45 cm. alta inflorescentia inclusa. *Culmi* geniculato-ascendentes, multinodi nodis glabris, iterum ramosi. *Foliorum* vaginae solutae, glabrae; ligulae breves, ciliatae; laminae lineares, 3–10 cm. longae, 0·1–0·3 cm. latae, planae vel laxe convolutae, apice attenuatae, pungentes. *Racemi* graciles, 2–4 cm. longi, plerumque ramosi. *Spiculae* uniseriatae, 2·2–3 mm. longae, glabrae. *Glumae* inaequales; inferior 3-nervis, ovato-acuta vel acuminata, 2 mm. longa; superior 5–7-nervis, spiculam aequans. *Anthoecium* inferum ad valvam 5–7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, 3 mm. longum, rugulosum.

W. Australia: Kiminoppin, *Stoward* 200!; Transcontinental Railway, East of Coolgardie, *Stoward* 139; and without precise locality, *Drummond*.

8. **P. gracile** (*R. Br.*) *Hughes* nov. comb.; *Panicum gracile* R. Br. Prod. 190 (1810); Benth. Fl. Austral. vii. 475.

W. Australia: Dampier's Archipelago, *Walcot*; Hunter's River, *Wilkes*; Swan River, *Drummond* 101.

Queensland: Keppel Bay, *Brown* 6096!; and without precise locality, *Bailey*.

var. **rugosum** *Hughes* nov. var.; *P. flavidum* var. *tenuior* Benth. Fl. Austral. vii. 474 (1878) p.p.

Differing from the type in the fruiting valve which is coarsely rugose not finely rugulose.

S. Australia: Vicinity of Lake Eyre, *Andrews* 3; Arkaringa Creek, *Elder Exploring Expedition*; Port Augusta, *Lea*; and without precise locality, *Gosse* 186.

N. S. Wales: Mount Hope, *Mitchell*; New England, *Stuart*; Lachlan River, *Fraser*; and without precise locality, *Cunningham*.

9. **P. rarum** (*R. Br.*) *Hughes* nov. comb.; *Panicum rarum* R. Br. Prod. 189 (1810); Benth. Fl. Austral. vii. 473.

N. Territory: Gulf of Carpentaria, *Brown* 6100!.

S. Australia: without precise locality, *Gosse* 56.

VI. **Urochloa** *Beauv.* Agrost. 52, t. xi, f. i. (1812).

| | |
|---|---|
| Spikelets 0·2 cm. long - - - | 1. *reptans*. |
| Spikelets 0·35–0·5 cm. long: | |
| Fertile floret coarsely rugose; mucro about 0·1 cm. long; lower glume short, hyaline, nerveless: | |
| Spikelets glabrous - - - | 2. *notochthona*. |
| Spikelets pubescent and laterally ciliate - | 3. *Gilesii*. |

Fertile valve finely rugulose and smooth; mucro very minute; lower glume 0·15–0·2 cm. long, 3–nerved - - - - 4. *praetervisa.*

1. **U. reptans** (*Linn.*) *Stapf* in Prain Fl. Trop. Afr. ix. 601 (1920); *Panicum reptans* Linn. Syst. Nat. ed. x. 870 (1759); *P. repens* Burm. f. Fl. Ind. 2. f. 1 (1768) non Linn.; *P. prostratum* Lam. Ill. i. 171 (1791); Benth. Fl. Austral. vii. 476 (1878); *P. barbatum* Linn. l.c.; *P. caespitosum* Sw. Fl. Ind. Occ. i. 146 (1797); *P. Sieberi* Link, Hort. Berol. i. 207 (1827); *P. procumbens* var., Nees Agrost. Bras. 109 (1829); *P. crispum* Llanos, Fragm. 42 (1851); *P. insularum* Steud. Syn. Pl. Glum. i. 61 (1854); *P. calaccanzense* Steud. l. c. 65; *P. aurelianum* Hale in Wood, Class-book, ed. iii, 787 (1861); *P. viaticum* Salzm. ex Doell. in Mart. Fl. Bras. ii, ii, 155 (1877); *P. marginatum* Vahl. ex Hook. f. Fl. Brit. Ind. vii. 33 (1897); *Brachiaria prostrata* Griseb. in Abh. Ges. Wiss. Goett. vii. 263.

N. Territory: Upper Victoria River, *Mueller*; Victoria River, Sandy Island, *Mueller.*

2. **U. notochthona** (*Domin*) *Hughes* nov. comb.; *Panicum notochthonum* Domin in Fedde, Repert. x. 60 (1911); *P. helopus* Benth. Fl. Austral. vii. 476 (1878) non Trin.

N. S. Wales: Darling River, *Dallachy*; Tongo Station, Wilcannia, *Hourigan.*

3. **U. Gilesii** (*Benth.*) *Hughes* nov. comb.; *Panicum Gilesii* Benth. Fl. Austral. vii. 477 (1878).

N. Territory: Charlotte Waters, *Giles*!.

S. Australia: Finde River, *Mueller*; and without precise locality, *Gosse* 187.

N. S. Wales: Coonamble, *French.*

4. **U. praetervisa** (*Domin*) *Hughes* nov. comb.; *Panicum praetervisum* Domin in Biblioth. Bot. lxxxv. 309 (1915); *P. adspersum* Benth. Fl. Austral. vii. 481 (1878) non Trin.

S. Australia: Vicinity of Lake Eyre, *Andrews* 156; Mt. Lyndhurst, *Max Koch* 60.

VII. **Echinochloa** *Beauv.* Agrost. 53, t. ii., f.2. (1812).

Spikelets awnless or mucronate only, densely crowded in four rows along the rhachis, without hairs or bristles - - - - 1. *colona.*
Spikelets mostly acuminate or awned, crowded and clustered along the rhachis, usually intermixed with rigid hairs or bristles - - - 2. *Crus-Galli.*

1. **E. colona** (*Linn.*) *Link* Hort. Berol. ii. 209 (1833); *Panicum colonum* Linn. Syst. Veg. ed. x. 870; Benth. Fl. Austral. vii. 478.

N. Territory: near Darwin, *Allen* 23.

2. **E. Crus-Galli** (*Linn.*) *Beauv.* Agrost. 161 (1812); *Panicum Crus-Galli* Linn. Sp. Pl. ed. i. 56 (1753); Benth. Fl. Austral. vii. 479; *Milium Crus-Galli* Moench. Method. 202 (1794); *Oplismenus Crus-Galli* Kunth, Enum. i. 143 (1833); *Orthopogon Crus-Galli* Spreng. Syst. i. 307 (1825).

W. Australia: Albany, *Andrews* 1st coll.

N. Territory: Victoria River, *Elsey*; Upper Victoria River, *Mueller*; Shoalwater Bay, *Brown* 6103; Daintree River, *Mueller*.

Queensland: Port Molle, dried up fresh water swamps, *McGillivray*. Parramatta, *Woolls*.

N. S. Wales: McIntyre River, *Ker*; Port Jackson, *Brown*; Sydney, *Moore* 161; *Stephenson* 257, 258; and without precise locality, *Mitchell*.

var. (?) **lacunarium** *Hughes* nov. comb.; *Panicum lacunarium* F. Muell. in Trans. Vict. Inst. 1855, 47; *Panicum Crus-Galli* var. *lacunarium* F. Muell. Fragm. viii. 198 (1874).

N. S. Wales: Murray River, *Mueller*.

VIII. **Paractaenum** *Beauv.* Agrost. 47, t.x, f. 6 (1812); Hughes in Kew Bull. 1923, p. 287.

**P. novae-hollandiae** *Beauv.* l.c.; *Panicum paractaenum* Kunth Enum. i. 134 (1833); *P. reversum* F. Muell. Fragm. viii. 152 (1874); Benth. Fl. Austral. vii. 478.

W. Australia: Murchison River, *Oldfield*; Shark's Bay (?), Îles Stériles, *Leschenault*; and without precise locality, *Drummond*.

N. Territory: Lake Amadeus, *Giles*.

S. Australia: Vicinity of Lake Eyre, *Andrews* 44.

IX. **Panicum**, *Linn.* Sp. Pl. 55 (1753).

*Spikelets glabrous or only softly pubescent:

†Spikelets gaping early and permanently, more or less laterally compressed, the glumes and lower valve acuminate, often constricted and rather firmer towards the tip:

Lower glume half as long or as long as the spikelet:

Panicle large, decompound; lower glume shortly aristulate, almost as long to slightly longer than the spikelet:

Spikelets 3·5–4 mm. long; divisions of the panicle coarse and rigid - - - - - - 1. *trachyrhachis.*

Spikelets 2·5–3 mm. long; divisions of the panicle very fine and softly flexuose - - - - - 2. *delicatum.*

Panicle very scanty and sparingly branched; lower glume half as long as the spikelet - - - - 3. *fulgidum.*

Lower glume less than half as long as the spikelet :

Spikelets 3–4 mm. long :

Panicles up to 40 cm. long; spikelets subsessile, set obliquely and crowded on the short secondary branchlets of the panicle - 4. *cymbiforme.*

Panicles up to about 20 cm. long; spikelets not arranged as in *P. cymbiforme* :

Spikelets slender; pedicels like the panicle branches, long and extremely fine - - - 5. *capillipes.*

Spikelets plump; pedicels and panicle branches short and somewhat stout, crowded - 6. *airoides.*

Spikelets 2 mm. long - - - 7. *sarmentosum.*

†† Spikelets not gaping and compressed, or if at all dorsally :

Lower glume $\frac{2}{3}$–$\frac{3}{4}$ the length of the spikelet, prominently 5–7-nerved :

Panicle branches fine, flexuose, few-flowered; pedicels capillary, up to 1·5 cm. long, (*e descr.*) - - - 8. *simile.*

Panicle branches rather rigid; pedicels short and comparatively stout :

Compactly caespitose, 1–2-noded; spikelets 4·2–4·5 mm. long; lower glume acutely acuminate - - 9. *queenslandicum.*

Stoloniferous, stems many-noded, wiry; spikelets 3–3·5 mm. long; lower glume contracted in the middle, obtuse - - - - 10. *prolutum.*

Lower glume scarcely over half the length of the spikelet, usually short, truncate or subacute with the lateral nerves not prominent, often rudimentary or wanting :

‡ Culms few to many-noded, tufted, erect, never prostrate or creeping :

Panicle large, stiffly spreading, hardly exceeding the broad uppermost leaf; stems stout, semi-aquatic, compressible :

Lateral branchlets remaining approximate to the branches,

like the pedicels, stout, triquetrous and more or less grooved between the angles; lower valve ♂ - - - - - 11. *paludosum.*

Lateral branchlets spreading, slender, triquetrous but not grooved between the angles; lower valve θ - - - - 12. *decompositum.*

Panicle contracted, or if spreading, then with branches not rigid and straight, exserted:

Culms wiry, many-noded; leaves not over 0·3 cm. wide:

Spikelets 3·5–4 mm. long; panicle contracted, flexuose - 13. *Buncei.*

Spikelets 2·5 mm. long; panicle spreading, not flexuose - - - - 14. *larcomianum.*

Culms not wiry, or if so, then not more than 3-noded; leaves 0·3–1 cm. wide:

Spikelets 2·5–3 mm. long, panicle many - flowered, with the spikelets evenly distributed throughout; nodes glabrous; leaves 15–30 cm. long - - - 15. *Mitchelli.*

Spikelets about 2 mm. long, panicles few-flowered, with the spikelets in pairs at the ends of the long lateral branchlets; nodes bearded; leaves usually about 8–15 cm. long - - - - - 16. *effusum.*

‡‡ Culms many-noded, branching at the nodes, prostrate or creeping, annual:

Spikelets 2–3 mm. long:

Plants glabrous; stems very soft, compressible:

Panicle many-flowered, large, decompound effuse - 17. *acroanthum.*

Panicle few-flowered, about 4 cm. long, sparingly branched 18. *obseptum.*

Plant clothed with short tubercle-based hairs; stems hard, rather wiry; panicle scanty, 3–4 cm. long - - 19. *lachnophyllum.*

Spikelets 1·5–2 mm. long :

| | |
|---|---|
| Panicle scanty, sparingly branched, up to 5 cm. long with rigid branches; spikelets glabrous, shortly pedicelled; leaves ovate-lanceolate, 1–3 cm. long - - - - - - | 20 *pygmaeum.* |
| Panicle much branched with fine capillary branches up to about 15 cm. long; spikelets pubescent on long delicate pedicels; leaves ovate or tapering at the tip, 1·5–6 cm. long - - - - - - | 21. *trichoides.* |

**Glumes and lower valve sprinkled with short hooked hairs; panicle rigid, scanty and few-flowered; culms very wiry, much branched; leaf-blades more or less reduced — 22. *uncinulatum.*

1. **P. trachyrhachis** *Benth.* Fl. Austral. vii. 490 (1878).

N. Territory : Victoria River, *Elsey*; Port Darwin, *Schultz*!; Arnhem's Land, *McKinlay.*

2. **P. delicatum** *Hughes* nov. sp.

*Annua* ad 70 cm. alta panicula inclusa. *Culmi* erecti vel geniculato-ascendentes, teretes, usque ad 5-nodi nodis exsertis glabris. *Foliorum* vaginae subapertae, pilis paucis basi tuberculatis indutae; ligulae breves, dense ciliatae; laminae planae, usque ad 24 cm. longae, 0·6 cm. latae, utrinque pubescentes. *Panicula* laxa, decomposita, vix exserta, usque ad 35 cm. longa; rami ramulique capillares, scaberuli, ad extremitates spiculas brevipedicellatas gerentes, caeterum nudum. *Spiculae* hiantes, 2·5 mm. longae, glabrae. *Glumae* inaequales; inferior 3-sub-5-nervis, dorso scaberula, 2 mm. longa; superior 5-nervis, spiculam aequans. *Anthoecium* inferum ad valvam 5-nervem spiculam aequantem reductum. *Anthoecium* superum ♂, ovale, laevissimum, nitidum, 1·5 mm. longum.

N. Territory : near Port Darwin, *Allen* 176, 178!.

3. **P. fulgidum** *Hughes* nov. nom.; *P. bicolor* R. Br. Prod. 191 (1810); Benth. Fl. Austral. vii. 487, non Moench.

N. Territory : Port Darwin, *Schultz.*

Queensland : Brisbane River, *Mueller, Bailey.*

N. S. Wales : New England, Clifton, *Stuart*; Parramatta, *Woolls*; Port Jackson, *Brown* 6107!; Botany Bay, *Banks* and *Solander*; Maneroo, *Mrs. Calvert.*

4. **P. cymbiforme** *Hughes* nov. sp.

*Basis* incognita. *Culmus* florifer procerus, robustus, sparse et brevissime pubescens, nodis densius pubescentibus. *Foliorum*

vaginae laxiusculae, uti laminae inter nervos prominentes sparse pubescentes vel glabrescentes; ligulae breves, dense ciliatae; laminae planae vel laxe convolutae, usque ad 30 cm. longae, basi circiter 0·6 cm. latae, apice longe attenuatae. *Panicula* usque ad 40 cm. longa, non multo divisa; axis primarius robustus, internodiis paucis usque ad 12 cm. longi; ramuli perbreves 0·5-1 cm. longi, glomeruliformes. *Spiculae* subsessiles, obliquae, 3·5 mm. longae. *Glumae* valde inaequales; inferior cymbiformis, 3-sub-5-nervis, 1 mm. longa; superior spiculam aequans, prominenter 7-nervis. *Anthoecium* inferum ♂; valva spiculam aequans, medio profunde canaliculata, 5- sub-7-nervis; valvula ad margines anguste alata; antherae 1·5 mm. longae. *Anthoecium* superum ♂, laevissimum, nitidum, 2·2 mm. longum. —*P. antidotale* Benth. Fl. Austral. vii. 483 (1878) p.p. non Retz.

W. Australia: Cygnet Bay, *Cunningham* 341 !.

5. **P. capillipes** *Benth.* Fl. Austral. vii. 484 (1878).

W. Australia: Escape Cliffs, *Hulse.*

N. Territory: Port Darwin, *Schultz* 806 !.

6. **P. airoides** *R. Br.* Prod. 190 (1810); *P. repens* Benth. Fl. Austral. vii. 484 (1878).

Queensland: Gulf of Carpentaria; *Brown* 6112 !, *Henne.*

N. S. Wales: Endeavour River, *Banks* and *Solander*; Murray River, *Mueller.*

7. **P. sarmentosum** *Roxb.* var. **Prenticeanum** *Domin* in Biblioth. Bot. lxxxv. 315 (1915); *P. Prenticeanum* Bail. Syn. Queensl. Fl. Suppl. iii. 82 (1890).

Queensland: Rockingham Bay, *Dallachy*; Russell River, Harvey's Creek, *Bailey* !.

8. **P. simile** *Domin* in Biblioth. Bot. lxxxv. 322 (1915) e descr.; *P. Mitchelli* Benth. Fl. Austral. vii. 489 (1878) p.p.

Queensland: Cape York, *Damel.*

9. **P. queenslandicum** *Domin* in Fedde, Repert. x. 59 (1911); *P. prolutum* Benth. Fl. Austral. vii. 491 non F. Muell.; *P. Benthami* Domin l.c.; *P. Shirleyanum* Domin in Biblioth. Bot. lxxxv. 321.

Queensland: Condamine River, *Hartmann*; Peak Downs, *Mueller*; Springsure, *Wuth.*

W. Australia: Hunter's River, *Wilkes.*

There seems to be no distinct difference by which to separate specifically *P Shirleyanum* from *P. queenslandicum.* The spikelets are identical. The specimen from the Condamine River, which is the type of *P. queenslandicum*, is about 15 ins. high with narrow convolute leaves. Of the two specimens from Springsure and Peak Downs which are enumerated under the description of *P. Shirleyanum* (*P. Benthami* Domin non Steud.) the former

is a short plant, about 10 ins. high with narrow, flat or loosely convolute leaves, while the latter, which is without a base, is taller and much more luxuriant. The leaves are broad and flat, or with a tendency at the margins to roll inwards. In the Hunter's River specimen they are narrow and loosely convolute.

10. **P. prolutum** *F. Muell.* in Trans. Vict. Inst. 1855, 46: Benth. Fl. Austral. vii. 490.

N. S. Wales: Murray River, *Mueller*; Murrimbidgee River, *Mueller*; Darling River, *Dallachy*; Zara via Hay "*E. Officer*"

Victoria: Avoca River, *Mueller*.

11. **P. paludosum** *Roxb.* Fl. Ind. i. 307 (1820); *P. decompositum* Benth. Fl. Austral. vii. 484 (1878) p.p. non R. Br.; *P. proliferum* F. Muell. Fragm. viii. 191 (1874) non Lam.

N. Territory: Victoria River, *Mueller*.

Queensland: Archer's Lagoon, *Leichhardt*; King's Creek, *Bowman*.

12. **P. decompositum** *R. Br.* Prod. 191 (1810).

Key to the Varieties.

Spikelets 2·5–3 mm. long; leaves usually smooth:
- Culms many-noded, slender, 1–2 mm. in diameter; leaves long, linear, not over 2 mm. wide - - - var. *tenuius*.
- Culm 3–4-noded, stout, 4–6 mm. in diameter; leaves tapering, about 1 cm. wide at the base - - var. *typicum*.

Spikelets 3·5–4 mm. long; leaves scabrid towards the tip:
- Leaf-sheaths glabrous and smooth, leaves narrow, about 4 mm. wide at the base, acuminate, long tapering to a fine point; lower valvule 3·5 mm. long, margins distinctly fringed - - var. *acuminatissimum*.
- Leaf-sheaths shortly pubescent with tubercle-based hairs; leaves broad at the base (1 cm. wide or wider); lower valvule 2 mm. long, margins very narrow, glabrous, or with a few very short cilia - - - - var. *scaberrimum*.

var. **tenuius** *F. M. Bailey*, Queensl. Agric. Journ. xxx. 314 (1913).

Queensland: Gindie, *Bick* 5, 6, 7, 8.

var. **typicum** *Domin* in Journ. Linn. Soc. xli. 269 (1912); var. *utile* Domin l.c.; *P. Whitei* J. M. Black in Trans. Roy. Soc. S. Austral. xli. 632 (1917).

W. Australia : between the Ashburton and the De Gray Rivers, *Clement*; between the Ashburton and Yule Rivers, *Clement*; Murchison District, *Stoward* 161; Murchison River, Oolingarra, *Oldfield*; Swan River, *Drummond* 43.

N. Territory : Victoria River, *Mueller*, p.p.

S. Australia : " camp 15 " (Everard and Musgrave Ranges), *Helms*; Mt. Lyndhurst, *Max Koch* 448; vicinity of Lake Eyre, *Andrews* 129, 155; Strzelecki Creek, *White* 3; and without precise localities, *Gosse* 112, *McDougal Stuart* 25.

Queensland : Carpentaria, *Brown*; Keppel Bay, *Brown* 6104 !; Port Curtis, *McGillivray*; Moreton Bay, *Mueller*.

N. S. Wales : Zara via Hay, " *E. Officer* "; Macaulay River, *Oldfield*.

var. **acuminatissimum** *Domin* l.c.

W. Australia : between the Ashburton and De Gray Rivers, *Clement* !.

N. Territory : Victoria River, *Mueller* p.p.

Queensland : Carpentaria, *Brown* p.p.; Gindie, *Bick*.

N. S. Wales : Macquarie and Castlereagh Rivers, *Woolls*; Hastings River, *Beckler*.

var. **scaberrimum** *Domin* l.c.

W. Australia : Cygnet Bay, *Cunningham* 340; between the Ashburton and De Gray Rivers, *Clement* !; Nicol Bay and De Gray River, *Ridley's Expedition*.

13. **P. Buncei** *F. Muell. ex Benth*. Fl. Austral. vii. 487 (1878).

N. S. Wales : Bokhara Flats, *Leichhardt* !; Pillega Scrub, *Fry*.

14. **P. larcomianum** *Hughes* nov. sp.

*Perennis*, caespitosa, usque ad 90 cm. alta panicula inclusa, glabra. *Culmi* erecti vel subgeniculato-ascendentes, lignosi, ramosi, multinodi nodis exsertis. *Foliorum* vaginae apertae; ligulae brevissimae, ciliolatae; laminae tenuiter convolutae, circiter 6–13 cm. longae, apice attenuatae, pungentes. *Panicula* decomposita, circiter 20 cm. longa, pauciflora; rami ramulique filiformes, leviter scaberuli. *Spiculae* ovatae, acutae, 2·5 mm. longae. *Glumae* inaequales; inferior acuta, 3–5 nervis, 1·2 mm. longa; superior 7-nervis, spiculam aequans. *Anthoecium* inferum $\theta$; valva 7–9 nervis, spiculam aequans; valvula reducta, 1·2 mm. longa. *Anthoecium* superum $\delta^{\mathrm{+}}_{\mathrm{+}}$, ovato-oblongum, 1·8 mm. longum, nitidum, brunnescens.

Queensland : Mt. Larcom, *Bick*. !

15. **P. Mitchelli** *Benth*. Fl. Austral. vii. 489 (1878).

Queensland : Endeavour River, *Cunningham* 347 !; Cape Grafton, *Cunningham* 51; Rockingham Bay, *Dallachy*.

16. **P. effusum** *R. Br.* Prod. 191 (1870); *P. convallium* F. Muell. in Trans. Vict. Inst, 1855, 46; *P. effusum* var. *convallium* Benth. Fl. Austral. vii. 488 (1878).

W. AUSTRALIA: Fraser's Range, *Dempster*.

S. AUSTRALIA: Torrens River, *Mueller*; and without precise locality, *Gosse* 231.

QUEENSLAND: Lizard Island, *McGillivray*; Cape Grafton, *Cunningham* 51; Herbert's Creek, *Bowman*; Rockhampton, *Bowman, Lea*.

N .S. WALES: McIntyre River, *Ker*; Blue Mountains, *Woolls*; Parramatta, *Woolls*; Port Jackson, *Brown*; Manduruga Creek, *Victorian Expedition*; Murray River, *Mueller*; and without precise locality, *Sieber* 67.

17. **P. acroanthum** *Steud.* Syn. Pl. Glum. 87 (1854); *P. melananthum* F. Muell. in Trans. Vict. Inst. i, 47 (1855); Benth. Fl. Austral. vii. 488; *P. coloratum* F. Muell. Fragm. viii. 192 (1874) non Linn.

QUEENSLAND: Brisbane River, *Bailey*.

N. S. WALES: near Tenterfield, *Stuart*; Clarence River, *Wilcox*.

VICTORIA: King River, *Mueller*; Orient River, *Mueller*.

18. **P. obseptum** *Trin.* Gram. Pan. Diss. ii. 149 (1826); Benth. Fl. Austral. vii. 486.

N. S. WALES: New England, *Stuart*; Parramatta, *Woolls*; Port Jackson, *Woolls!*.

19. **P. lachnophyllum** *Benth.* Fl. Austral. vii. 486 (1878).

QUEENSLAND: Moreton Bay, *Stuart!*.

20. **P. pygmaeum** *R. Br.* Prod. 191 (1810); Benth. Fl. Austral. vii. 484.

QUEENSLAND: Cleveland Bay, *Gulliver*; Brisbane River, *Mueller*.

N. S. WALES: Blue Mountains, *Miss Atkinson* (*Mrs. Calvert*); Coffs Harbour, *Boorman* 826; Port Jackson, *Brown* 6108!.

21. **P. trichoides** *Sw.* Prod. Veg. Ind. Occ. 24 (1788); Benth. Fl. Austral. vii. 485; *P. minutum*, R. Br. Prod. 191 (1810).

N. TERRITORY: Port Darwin, *Schultz* 264.

QUEENSLAND: Daintree River, *Fitzalan*; Endeavour River, *Banks* and *Solander* 17, p.p.

22. **P. uncinulatum** *R. Br.* Prod. 191 (1810); Benth. Fl. Austral. vii. 482.

QUEENSLAND: Rockhampton, *O'Shanesy*; Herbert's Creek, *Bowman*; Burnett River, *Mueller*; East Coast, *Brown!*.

In the form of the inflorescence and in the shape and indumentum of the spikelets there is a certain resemblance between

this species and *Pseudechinolaena polystachya* Stapf (*Echinolaena polystachya* H.B. & K.), but in the former the back of the fruit is apparently adaxial and the lower glume is small and not herbaceous. The specimens quoted are scanty and in poor condition, but when better material is available it will show whether this affinity is true or only superficial, or whether the species is perhaps worthy of distinct generic rank. The nearest ally, *Panicum numaeënse* Bal. (in Bull. Soc. Bot. Fr. xix. 325, 1872) from New Caledonia, may prove to be identical with it when more complete specimens of each species have been examined.

X. **Ichnanthus** *Beauv.* Agrost. 56, t. xii, f. 1 (1812).

Leaves ovate-lanceolate, about 1 cm. or more wide; lower floret ♂ - - - 1. *pallens.*
Leaves linear; lower floret θ; valvule rudimentary or none:
Spikelets oblong, obtuse, 3 mm. long; panicle much contracted; branches slender - - - - - - - 2. *oblongus.*
Spikelets ovate, acute or acuminate, 4–6 mm. long; panicle stiffly spreading:
Culms hard and woody; leaves and sheaths glabrous or with short scattered tubercle-based hairs:
Culms fastigiate; plants 7–20 cm. high; panicle exceeded by the uppermost sheaths:
Spikelets 3·5–4 mm. long; lower glume ovate, acute, about 2 mm. long; upper glume 7-nerved - 3. *australiensis.*
Spikelets 5 mm. long; lower glume ovate-acuminate, 3 mm. long; upper glume 9-nerved - - - - 4. *Muelleri.*
Culms not fastigiate; plants tall; panicle exceeding the uppermost sheath; spikelets 5–6 mm. long - 5. *majusculus.*
Culms soft, fine, few-noded, not much branched; leaves and sheaths densely white-hirsute all over; spikelets 5 mm. long - - - - - - - 6. *pauciflorus.*

1. **I. pallens** (*Sw.*) *Munro* in Benth. Fl. Hongk. 414 (1861); *Panicum pallens* Sw. Prod. 23 (1788); *P. vicinum* Bailey Syn. Queensl. Fl. Suppl. iii. 82 (1890).

QUEENSLAND: Harvey's Creek, *Bailey.*

2. **I. oblongus** *Hughes* nov. sp.

*Basis* incognita. *Culmi* geniculato-ascendentes, multinodi nodis nigris glabris. *Foliorum* vaginae solutae, striatae, pilis

albidis basi tuberculatis sparse hirsutae; ligulae breves, membranaceae, integrae, a dorso longe ciliatae; laminae lanceolatae, 6–8 cm. longae, apice attenuatae, 0–5 cm. latae, basi auriculatae, abrupte constrictae, glabrae. *Panicula* vix exserta, anguste contracta, 12 cm. longa ramis ramulisque tenuibus. *Spiculae* oblongae, obtusae, 3 mm. longae, glabrae. *Glumae* inaequales; inferior 3-nervis, 2 mm. longa; superior 7-nervis, 2·5 mm. longa. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum 3 mm. longum appendice 0·3 mm. longo incluso.—*Panicum trachyrhachis* var. *tenuior* Benth. Fl. Austral. vii. 490 (1878) p.p.

Queensland: Percy Island, *Cunningham*!.

With some hesitation this species is included in *Ichnanthus*. The basal appendage is not very obvious and may be only analogous to the slightly elongated internode found in *Panicum capillipes* Benth. and also in *P. stipitatum* Nash, from North America. The general habit with geniculate branching culms and flat lanceolate leaves is rather more in accord with the Australian species of *Ichnanthus* than with the Australian species of *Panicum*. The one specimen quoted is scanty and incomplete so that it is impossible to dissect a number of spikelets for examination.

3. **I. australiensis** (*Domin*) *Hughes* nov. comb.; *Panicum australiense* Domin in Journ. Linn. Soc. xli. 271 (1912); *P. pauciflorum* Benth. Fl. Austral. vii. 488 (1878), p.p., non R.Br.

W. Australia: between the Ashburton and De Gray rivers, *Clement*!; between the Ashburton and Yule Rivers, *Clement*!.

N. Territory: Lat. 17° 58, *MacDougal Stewart's Expedition*; near Alice Springs, *Giles*; upper Victoria River, *Mueller*.

4. **I. Muelleri** *Hughes* nov. sp.

*Annua*, usque ad 20 cm. alta. *Culmi* lignosi, geniculato-ascendentes, multinodi nodis pubescentibus, iterum ramosi. *Foliorum* vaginae solutae, striatae, pilis brevibus basi tuberculatis indutae; ligulae breves, dense ciliatae; laminae lineares, laxe convolutae, usque ad 8 cm. longae et ad 0·3 cm. latae applanatae. *Panicula* non exserta, ovata; rami ramulique tenuissimi, patentes. *Spiculae* ovato-oblongae, acuminatae, 5 mm. longae, glabrae. *Glumae* inaequales; inferior ovata, acuminata, 7-nervis, 3 mm. longa; superior 9-nervis, spiculam aequans. *Anthoecium* inferum ad valvam 7-nervem spiculam aequantem reductum. *Anthoecium* superum ♂♀, 3 mm. longum appendice 1 mm. longo incluso.

W. Australia: near King's Sound *Mueller*!.

5. **I. majusculus** (*F. Muell.*) *Hughes* nov. comb.; *Panicum majusculum* F. Muell. ex Benth. Fl. Austral. vii. 482 (1878).

N. Territory: Victoria River, *Elsey*!.

**I. pauciflorus** (*R. Br.*) *Hughes* nov. comb.; *Panicum pauciflorum* R. Br. Prod. 191 (1810).

N. Territory: Gulf of Carpentaria, *Brown!*.

XI. **Cyrtococcum** *Stapf* in Prain Fl. Trop. Afr. ix. 745 (1920).

**C. oxyphyllum** (*Steud.*) *Stapf* ms., nov. comb.; *P. oxyphyllum* Steud. Syn. Pl. Glum. 65 (1854), *P. hermaphroditum* Steud. l.c. 67; *P. pilipes* Nees & Arn. ex Büse in Miq. Pl. Jungh. iii. 376 (1854).

Queensland: Daintree River, *Fitzalan*.

XII. **Sacciolepis** *Nash* in Britton Man. Bot. 89 (1901).

Spikelets 2·5 to 3 mm. long, acuminate, not turgid - - - - - - - - 1. *indica.*

Spikelets 1-1·2 mm. long, acute or subobtuse, turgid - - - - - - - - 2. *myosuroides.*

1. **S. indica** (*Linn.*) *Chase* in Proc. Biol. Soc. Wash. i. 8 (1908); *Aira spicata* Linn. Sp. Pl. 63 (1753); *A. indica* L. Sp. Pl. (1753) in Errata; *Panicum indicum* L. Mant. ii. 184 (1774); *P. angustum* Trin. Sp. Gram. t. 334 (1836); *P. arcuatum*, R. Br. Prod. 189 (1810); *P. phleoides* R. Br. l.c.; *Hymenachne indica* Büse in Miq. Pl. Jungh. 377 (1854).

N. Territory: Port Darwin, *Schultz* 145; near Darwin, *Allen* 91; and without precise locality, *Gulliver*.

Queensland: Wide Bay, *Leichhardt*; Moreton Bay, *Mueller*; Etheridge River, *Mueller*.

N. S. Wales: Port Jackson, *Boorman* 613, *Banks* and *Solander*.

2. **S. myosuroides** (*R.Br.*) *Hughes* nov. comb.; *Panicum myosuroides* R.Br. Prod. 189 (1810).

N. Territory: Victoria River, *Mueller*; Port Darwin, *Schultz*.

Queensland: Endeavour River, *Banks* and *Solander*, *Cunningham* 136; Dawson River, *Mueller*.

XIII. **Hymenachne** *Beauv.* Agrost. 48, t. 10, f. 18 (1812).

**H. amplexicaulis** (*Rudge*) *Nees* Agrost. Bras. 276 (1829); *Panicum amplexicaule* Rudge, Pl. Guian. i. 27 (1805); *P. hymenachne* Desv. Opus. 82 (1831); *P. myuros* of authors not Lam.; *Agrostis monostachya* Poir. Encycl. Suppl. i. 256 (1810).

Queensland: Trinity Bay, *Bailey*.

XIV. **Entolasia** *Stapf* in Prain Fl. Trop. Afr. ix. 739 (1920).

Leaves convolute, rigid and pungent; culms slender, wiry; spikelets 2·5 mm. long- - - 1. *stricta.*

Leaves broad, flat, long tapering to a fine point; culms not wiry; spikelets 3–3·5 mm. long - - - - - - - - - 2. *marginata*.

1. **E. stricta** (*R.Br.*) *Hughes* nov. comb.; *Panicum strictum* R. Br. Prod. 190 (1810); *P. marginatum* var. *strictum* Benth. Fl. Austral. vii. 486 (1878).

QUEENSLAND: Moreton Bay, *Mueller*.

N. S. WALES: McIntyre River, *Ker*; Sydney, *Stephenson* 119, *Banks* and *Solander*, *Lowne*; Port Jackson, *Mueller*, *Sieber Agrostoth*. 90, *Brown* 6099!, *Moore* 30, 52, 56, *Maiden* 186; Botany Bay, *Boorman* 186a; and without precise locality, *Caley*.

2. **E. marginata** (*R.Br.*) *Hughes* nov. comb.; *Panicum marginatum* R. Br. Prod. 190 (1810); *P. marginatum* var. *majus* Benth. Fl. Austral. vii. 486 (1878).

QUEENSLAND: Wide Bay, *Mueller*.

N. S. WALES: New England, *Stuart*; Hastings River, *Moore* 46; Port Jackson, *Brown* 6113!, *Sieber Agrostoth*. 69, 71*; Macleay River, *Beckler* 8759; and without precise locality, *Caley*, *Mitchell*, *Stuart*.

VICTORIA: Between the Goulburn and Broken River, *Mueller*; Tambo, *Mueller*.

* MBG sheet is E. stricta

## Imperfectly known Species.

**Panicum aequabile** *Domin* in Biblioth. Bot. lxxxv. 297 (1915), placed in § *Digitaria*. The description of the panicle is suggestive of *Leptoloma*.

QUEENSLAND: Waterfall Creek, *Domin* I. 1910.

**P. breviglume** *Domin* l.c. 298, is obviously allied to *Digitaria tenuissima*, *D. diminuta* and *D. orbata*, but seems to be a distinct species.

QUEENSLAND: Dividing Range, *Domin* II. 1910.

**P. chillagoense** *Domin* l.c. 324, is probably a true *Panicum*.

QUEENSLAND: near Chillagoe, *Domin* II. 1910.

**P. Clementii** *Domin* in Journ. Linn. Soc. xli. 272 (1912). From the description this is probably near *Paspalidium gracile*.

N. W. AUSTRALIA: Ashburton and Yule Rivers, *Clement*.

**P. commixtum** *Steud*. Syn. Pl. Gram. 59 (1854). Apparently a *Brachiaria* or *Paspalidium*.

N. S. WALES: Port Jackson, (Collector?).

**P. constrictum** *Domin* l.c. 302, is probably *Paspalidium gracile*, var. *rugosum*.

QUEENSLAND: near Pentland, *Domin* II. 1910.

**P. culicinum** *F. Muell.* Fragm. viii. 189, is, according to Bentham in Fl. Austral. vii. 475, a synonym of *P. obtusum* from Mexico.

**P. deschampsioides** *Domin.* l.c. 320. A true *Panicum*, probably quite distinct.

QUEENSLAND : Castle Hill near Townsville, *Domin* II. 1910.

**P. incomptum** *F. Muell.* Fragm. x. 76. See note in Benth. Fl. Austral. vii. 489.

**P. leucostachyum** *Domin* l.c. 299. Evidently closely allied to *Digitaria villosa.*

QUEENSLAND : Russell River, *Domin* I. 1910; Dividing Range, east of Pentland, *Domin* II. 1910; Stradbroke Island in Moreton Bay, *Domin* IV. 1910.

**P. nematostachyum** Bail. Bot. Bull. Dept. Agric. Queensl. 16.2. (1903). Judging from the description this must be near *Digitaria coenicola.*

**P. seminudum** *Domin* l.c. 321. This species seems closely allied to and may be the same as *P. gracilipes*, but the panicle is more stiffly spreading and the lower glume seems smaller in proportion to the rest of the spikelet.

N. QUEENSLAND : near Yarraba, *Domin* I. 1910.

**P. singulare** *Steud.* Syn. Pl. Gram. 60 (1854) is an *Entolasia*, probably *E. marginata.*

**P. subjunceum** *Domin* l.c. 314. The illustration of this species shows it to be quite distinct.

QUEENSLAND : Dividing Range, east of Pentland, *Domin* II. 1910.

**P. subxerophilum** *Domin* l.c. 316. Allied to *P. bicolor*, but it has a different habit, entire ligule and obtuse spikelets.

QUEENSLAND : Dividing Range near Jericho, *Domin* III. 1910.

**P. tabulatum** *Hack.* in Engl. Jahrb. vi. 234 (1885). Probably allied to *Paspalidium gracile.*

W. AUSTRALIA : Dampier's Archipelago, *Naumann.*

**P. tubulatum** in the Index Kewensis is an obvious error for *P. tabulatum* (see above).

**P. tulcumbense** *Turner* in Proc. Linn. Soc. N. S. Wales. xxviii. 56 (1898). A true *Panicum* possibly near *P. gracilipes.*

N. S. WALES : Liverpool Plains, *Turner.*

**P. Whiteanum** *Domin* l.c. 305. This species is compared in the description with *P.* (*Brachiaria*) *piligerum* and *P.* (*Brachiaria*) *polyphyllum.*

# XXXIII.—CONTRIBUTIONS TO THE FLORA OF SINALOA: III.*

L. A. M. Riley.

Leguminosae, subfamily Papilionaceae.

**Crotalaria eriocarpa** *Benth.* Bot. Sulph. 80 (1844), quoad specimen Beecheyanum; Hemsl. Biol. i. 226, partim; Rose in CNH. viii. 47, in obs.; Zoe, v. 201; Standley in CNH. xxiii. 437. excl. syn. *C. viminalis*.—*C. incana* var. β Hook. et Arn. Bot. Beech. 285.

Tepic, *Lay and Collie*. Sinaloa: Mazatlan, fl. Dec. 1848, *Seemann* 1526; Cofradia, *Brandegee*.

Vernacular names "Tronador," "Cascabelito."

*C. eriocarpa* Benth. and *C. viminalis* Rose are different species, as pointed out by Rose, l.c. The type of the former is Lay and Collie's specimen from Tepic, which Hooker and Arnott previously described as *C. incana* var. β. Tate's specimen cited by Bentham, l.c., which is unlocalized, is probably *C. viminalis*.

*C. eriocarpa* differs from *C. viminalis* in the much shorter and more numerous branchlets clothed with a dense tawny subappressed indumentum: shorter racemes, smaller bracts and flowers, and the appressed indumentum of the calyx.

**Crotalaria polyphylla** *Riley*, sp. nov.; fruticulus foliis numerosis confertis lineari- vel oblongo-lanceolatis sericeis, caulibus inferne propter bases prominentes foliorum delapsorum nodulosis distinctus.

*Caules* lignosi, rigidi, ramosi, multifoliati, hornotini fulvo-sericei, annotini appresse griseo-pilosi, 1·5 mm. diametro 1 dm. infra apices. *Folia* simplicia, brevissime petiolata, ut videtur exstipulata, superiora lineari- vel oblongo-lanceolata, inferiora oblonga, acuminata, basi subrotundata, discolora, supra exsiccando brunnea, griseo-pilosa, subtus fulvo-sericea, 1·5–3 cm. longa, 3–5 mm. lata, inferiora quam superiora breviora et latiora; petioli vix 1 mm. longi. *Pedunculi* 2–2·5 cm. longi, pauciflori. *Bracteae* lineari-lanceolatae vel subulatae, fulvo-sericeae, 4–5 mm. longae. *Pedicelli* 5–6 mm. longi. *Bracteolae* lineari-acuminatae, parte calyci adnatae circiter 1 mm. longa, parte libera 3 mm. longa. *Calyx* fulvo-sericeus, in toto 11·5 mm. longus, in duo labia sinu 9 mm. alto divisus; labium superius dentibus triangularibus acutis basi 2·5 mm. latis, sinu intermedio 5 mm. alto; labium inferius dentibus acuminato-triangularibus basi 1·5 mm. latis, sinibus intermediis 7 mm. altis. *Corolla* pellucido-punctata; vexillum 1 cm. longum, 9 mm. latum, in basin gradatim angustatum; alae obovato-oblongae, 9 mm. longae ungue incluso, 3·5 mm. latae, venis conspicuis, ungue 1 mm. longo; carinae petala 9·5 mm. longa, 4 mm. lata, 6·5 mm. conjuncta, ungue 1 mm.

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* Continued from *K.B.*, 1923, p. 175.

longo. *Antherae* majores 2 mm. longae. *Ovarium* breviter stipitatum, glabrum, 5 mm. longum, circiter 12-ovulatum; stylus 6 mm. longus, parum barbatus. *Legumen* circiter 2 cm. longum, 8 mm. latum.—*C. Purshii* Seem. Bot. Herald, 279; Hemsl. Biol. i. 228. non DC.

Sierra Madre, *Seemann* 2187.

**C. rotundifolia** var. **brachytricha** *Sprague et Riley*, var. nov.; caulis et foliorum pilis duplo brevioribus a typo recedit.—*C. bupleurifolia* Seem. Bot. Herald, 279, non Cham. et Schlecht.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1534.

Specimens collected by Schiede on the Cuesta grande de Chiconquiaco (Herb. Hook., mixed with *C. bupleurifolia*) differ in the appressed indumentum of the stem, but are otherwise similar.

**C. sagittalis** *L.*; Britten and Baker in Journ. Bot. 1897, 227; Fawcett and Rendle, Fl. Jam. iv. part 2, 10.

San Ignacio : Arroyo del Agua Fria, 400 m., *Gonzalez* 764.

This is a variety or form with narrow leaves and appressed indumentum. A plant collected by Heyde and Lux in Guatemala (*Donnell Smith* 3731), named *C. bupleurifolia* by Micheli, apparently represents the same form. Specimens from Jamaica (*Harris* 11855 and 11965), differ only in the stipules being decurrent.

**C. vitellina** *J. B. Ker*, Bot. Reg. vi. 447; CNH. xxiii. 437.

Sinaloa (fide Standley).

Vernacular name "Tronador."

**Lupinus delicatulus** *Sprague et Riley*, sp. nov.; affinis *L. arvensi* Benth., innovationibus et caulibus junioribus patule hirsutis, foliolis pro rata angustioribus apiculatis nec mucronatis, bracteis longioribus, leguminibus fere dimidio angustioribus differt.

*Innovationes* ferrugineo-hirsutae. *Caules* graciles, inferne lignosi, 2–2·5 mm. diametro, juniores patule hirsuti et pilis brevioribus crispule pubescentes. *Folia* longiuscule petiolata, 5–7-foliolata; petioli 3·5–5 cm. longi, patule vel subappresse pilosi, basi vaginantes; stipulae ad vaginam 4 mm. longam adnatae, parte libera subulata 4–5 mm. longa; foliola oblanceolata, 1·3–2·3 cm. longa, 3·5–6·5 mm. lata, cuspidato-apiculata, longe appresse ferrugineo-ciliata, supra inconspicue appresse-pilosa, subtus glaucescentia manifestius pilosa. *Pedunculi* 7–14 cm. longi, appresse pilosi, juniores crispule etiam pubescentes; rhachis circiter 8 cm. longa. *Bracteae* e basi late obovata 4 mm. longa 3·5 mm. lata abrupte longe caudatae cauda 6 mm. longa, intus glabrae, extra longe pilosae. *Bracteolae* calyci 2 mm. adnatae, anguste lanceolatae, parte libera vix 2·5 mm. longa, 0·6 mm. lata. *Calyx* basi postice gibbosus, extra appresse aureo-pilosus, in toto 7 mm. longus, ad 2·5 mm. supra basin bilobus; labium superius 3·5 mm. longum, apice bifidum lobis subtriangularibus acutis 0·8 mm. longis; labium inferius 4·5 mm. longum. integrum. *Corolla* glabra; vexillum obovato-orbiculare

(ungue brevi late cuneato incluso) 1 cm. longum, 9 mm. latum, apice truncatum, minutissime emarginatum, callis 5 mm. supra basin sitis, 3 mm. longis, 2 mm. disjunctis; alae carinam aequantes, 1 cm. longae, ungue 2 mm. longo, lamina 8 mm. longa circiter 6 mm. lata; carina rostratofalcata. *Tubus stamineus* 5·5 mm. longus; antherae longiores 1·5 mm., breviores 0·5 mm. longae. *Ovula* circiter 9. *Legumen* lineari-oblongum, 2–2·5 cm. longum, 4·5–5 mm. latum, densiuscule ferrugineo-hirsutum.—*L. madrensis* Seem. Bot. Herald, 278, t. 53, pro parte minima.

Sierra Madre, *Seemann* sine numero (type in Herb. Kew), *Seemann* 2185 partim (Mus. Brit.).

Seemann collected two strikingly dissimilar species of *Lupinus* in the Western Sierra Madre, one with very long petioles and 7–10 nearly linear, acuminate leaflets, the other with relatively short petioles and 5–7 oblanceolate, cuspidate-apiculate leaflets. His description and figures of *L. madrensis* were taken mainly from the former, which must be regarded as the type of that species. The following parts of the description and plate of *L. madrensis* refer to the latter, which we have named *L. delicatulus*: "foliolis . . . subovato-oblongis," ". . . legumineque hirsutis," "Legumen about an inch long, 5–6-seeded," "Fig. 1, an entire leaf of a young plant."

*L. madrensis* and *L. delicatulus* are represented by separate sheets in the Kew Herbarium, the former being numbered 2185, and the latter being without number. In the British Museum there is only a single sheet, which is the type of Seemann's plate. It is numbered 2185, and has a specimen of *L. madrensis* on the top right-hand corner and one of *L. delicatulus* on the bottom left corner.

**L. madrensis** *Seem.* Bot. Herald, 278 (1856), t. 53 (1854), pro parte maxima.

Sierra Madre, in woods, *Seemann* 2185 (Herb. Kew et Mus. Brit.). Sinaloa, without precise locality, *Gonzalez* 112.

Vernacular name "Piojillo."

**Hosackia madrensis** *Sprague et Riley*, sp. nov.; affinis *H. gracili* Benth. a qua foliis superioribus etiam saepe 1-jugis, umbellis nunquam foliaceo-bracteatis, alis carinam parum excedentibus tantum, alarum et carinae petalorum lamina basi truncata nec distincte auriculata differt.

*Caules* graciles, filiformes, flexuosi, glaberrimi. *Folia* petiolata, inferiora trifoliolata, superiora quinquefoliolata; petioli 0·7–1 cm. longi, glabri; stipulae membranaceae, semisagittato-triangulares, acuminatae, 2·5–5 mm. longae, 1–3 mm. latae, integrae, glabrae, majores versus apices ramorum; foliola subsessilia, 6–15 mm. longa, 4–7 mm. lata, ea foliorum inferiorum late obovata apice rotundata, ea foliorum superiorum anguste obovata, subacuta vel apiculata, utrinque glabra, subtus glaucescentia costa brunnea conspicua. *Umbellae* 3–5–florae; pedunculi 3–4·5 cm. longi; pedicelli circiter 1 mm. longi. *Calyx* 6 mm.

longus, brunneo-lineatus; tubus vix 4 mm. longus; labia 2 mm. longa; dentes anteriores subulato-triangulares, 2 mm. longi, posteriores 1–1·3 mm. longi, pro rata latiores. *Vexillum* ungue 5·5 mm. longo, lamina sub angulo recto reflexa panduriformi 6 mm. longa 5 mm. lata apice emarginata septemnervi (nervis exterioribus minimis non inclusis); alae carinam vix excedentes, 1 cm. longae, ungue 5 mm. longo incluso; carina 9 mm. longa, ungue 5 mm. longo, superne valde arcuata (ultra angulum rectum) lamina basi subtruncata. *Tubus staminalis* 8·5 mm. longus. *Ovarium* breviter stipitatum; stylus sub angulo recto inflexus, 2·5 mm. longus.—*H. angustifolia* var. foliis latioribus, floribus pallidioribus, Seem. Bot. Herald 279 (1856); Hemsl. Biol. i. 234, partim.

Sierra Madre, *Seemann* 2180 (type in Herb. Kew.).

Parry and Palmer's no. 140, which Hemsley regarded as convarietal with Seemann's no. 2180, is typical *H. angustifolia* G. Don., which may be distinguished by the more numerous (5–9) appressed-pubescent leaflets and the foliaceous bract subtending the umbel.

Rose questions whether Seemann's plant may not be conspecific with *H. alamosana* Rose (CNH. i. 96; 1891). The material in the Kew Herbarium, however, shows that the two species are not nearly related.

**Eysenhardtia polystachya** (*Ort.*) *Sarg.* Silva, iii. 29; Safford in Ann. Rep. Smiths. Inst. 1915, 280, tt. 2. 3; N. Am. Fl. xxiv. 35; CNH. xxiii. 433.—*E. amorphoides* H.B.K.; SBH. 279; Hemsl. Biol. i. 236.

Cerro de Pinal, *Seemann* 1535.

Vernacular names "Rosilla," "Palo cuate."

This plant is the source of the Mexican "lignum nephriticum," a wood celebrated in Europe from the sixteenth century. Remarkable fluorescent phenomena are displayed by an infusion of the wood, to which various medicinal virtues have been attributed. A complete account is given by W. E. Safford, l.c.

**Dalea Cliffortiana** *Willd.* (1803).—*Psoralea Dalea* L. (1753). *P. annua* Mill. (1768), nomen abortivum. *Dalea nigra* Mart. et Gal. (1843). *D. annua* Kuntze (1891). *D. Dalea* MacM. (1892), tautonym. *Parosela nigra* Rose (1906). *P. Cliffortiana* Rose (1906). *Thornbera Dalea* Rydb. in N. Am. Fl. xxiv. 120 (1920). *Dalea elegans*? Hook. et Arn. Bot. Beech. 417 (1840–41); SBH. 280; non Hook. et Arn. (1833).

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1527.

**D. crassifolia** *Hemsl.* Biol. i. 238 (1880).—*D. pectinata*? SBH. 279; *Parosela crassifolia* Rose; N. Am. Fl. xxiv. 105; CNH. xxiii. 457.

Sierra Madre, *Seemann* 2190.

**D. crenulata** *Hook. et Arn.*—*Parosela crenulata* Rose; N. Am. Fl. xxiv. 59; CNH. xxiii. 454. *Dalea nutans* Hemsl. Biol. i. 244, partim, non Willd.

Sinaloa (fide Standley).

Vernacular name "Malva prieta."

**D. diffusa** *Moric.* Pl. Nouv. Am. 8, t. 6 (1833); SBH. 279; Hemsl. Biol. i. 238; Zoe, v. 201.—*Parosela diffusa* Rose; N. Am. Fl. xxiv. 59; CNH. xxiii. 454. *Dalea gracilis* Hook. et Arn. Bot. Beech. 286, non Kunth.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1524; Cofradia, *Brandegee.*

**D. Goldmani** (*Rose*) *Riley*, comb. nov.—*Parosela Goldmani* Rose in CNH. viii. 305 (1905); N. Am. Fl. xxiv. 53.

Sierra de Choix, *Goldman* 267.

**D. minor** (*Rose*) *Brandegee;* Zoe, v. 201.—*Parosela minor* Rose in CNH. viii. 305 (1905); N. Am. Fl. xxiv. 55.

Lodiego, *Palmer* 1624; Cofradia, *Brandegee.*

**D. occidentalis** (*Rydb.*) *Riley*, comb. nov.—*Parosela occidentalis* Rydb. in N. Am. Fl. xxiv. 115 (1920); CNH. xxiii. 455. *P. platyphylla* Rydb., l.c. *Dalea domingensis* Rose in CNH. i. 96 (1891).

Culiacan and Lodiego, *Palmer* 1783; Fuerte, *Rose, Standley and Russell* 13527.

Standley has reduced *P. platyphylla* to *P. occidentalis.* According to Rydberg's description the former has fewer leaflets and a longer indumentum, and is less densely gland-dotted.

**D. Palmeri** (*Rose*) *Riley*, comb. nov.—*Parosela Palmeri* Rose; N. Am. Fl. xxiv. 52; CNH. xxiii. 452.

Sinaloa (fide Rydberg and Standley).

**D. psoraleoides** *Moric.* Pl. Nouv. Am. 5, t. 4 (1833); SBH. 279; *D. verbenacea* var. *sericea* Schlecht. *Parosela psoraleoides* Rose; N. Am. Fl. xxiv. 91; CNH. xxiii. 462. *Dalea verbenacea* Hemsl. Biol. i. 248, non Schlecht. et Cham.

Sierra Madre, *Seemann* 2193.

**D. pumila** (*Rydb.*) *Riley*, comb. nov.—*Thornbera pumila* Rydb. in N. Am. Fl. xxiv. 120 (1920). *Parosela pumila* Macbride in Contrib. Gray Herb. n.s. lxv. 23 (1922).

Culiacan, *Brandegee.*

**D. revoluta** *S. Wats.;* Zoe, v. 201.—*Parosela revoluta* Rose. *Thornbera revoluta* Rydb. in N. Am. Fl. xxiv. 119.

San Ignacio: Pueblo de Ajoya, 260 m., *Gonzalez* 46; Los Chilles, 400 m., *Gonzalez* 723. Sinaloa, without precise locality, *Brandegee.*

**D. roseiflora** (*Rydb.*) *Riley*, comb. nov.—*Parosela roseiflora* Rydb. in N. Am. Fl. xxiv. 105 (1920); CNH. xxiii. 475. *Dalea*

*elata* (species 21) Hemsl. Biol. i. 239, partim, non Mart. et Gal.

Sierra Madre, *Seemann*.

**D. Seemannii** *S. Wats.* in PAA. xxii. 470 (1887).—*Parosela Seemannii* Rose; N. Am. Fl. xxiv. 88; CNH. xxiii. 463.

Sierra Madre, *Seemann* (Gray Herb.), *Seemann* 2188 (Herb. Kew).

The type of *D. Seemannii* is a specimen (apparently without number) in the Gray Herbarium collected by Seemann in the Sierra Madre. It is probably a duplicate of Seemann's no. 2188. Both Rydberg and Standley cite *D. Ehrenbergii* Schlecht. as being possibly conspecific, but a study of Schlechtendal's description reveals too many points of difference for their view to be accepted. The leaflets of *D. Seemannii* are rounded or emarginate at the apex, and the glands on the lower surface are conspicuous to the naked eye. *D. Ehrenbergii* has mucronate leaflets, and the glands on the lower surface are hardly visible without a lens. It seems to differ also in the spreading branches, the dense white indumentum of the younger parts, and the larger leaves and leaflets.

**D. sericocalyx** (*Rydb.*) *Riley*, comb. nov.—*Parosela sericocalyx* Rydb. in N. Am. Fl. xxiv. 63 (1919); CNH. xxiii. 451. *Dalea lachnostachys* Seem. Bot. Herald, 279 (1856), partim; Hemsl. Biol. i. 242, partim; non A. Gray.

Sierra Madre, *Seemann* 2182.

**D. similis** *Hemsl.;* Biol. i. 246.—*Parosela similis* Rose; N. Am. Fl. xxiv. 80. *Dalea flava* Seem. Bot. Herald, 280, non Mart. et Gal.

Cerro de Pinal, Dec. 1848, *Seemann* 1533.

**D.** sp.

San Ignacio: Cordon de Balboa, 1060 m., *Gonzalez* 787.

More complete material is required before the species can be satisfactorily determined.

**Indigofera discolor** *Rydb.* in N. Am. Fl. xxiv. 147 (1923). Lodiego, *Palmer* 1634.

**I. mucronata** *Spreng.;* Hemsl. Biol. i. 251, excl. syn.; CNH. xxiii. 440.

Sinaloa (fide Standley).

Fawcett and Rendle (Fl. Jam. iv. part 2, 17) follow Grisebach in reducing *I. mucronata* to *I. subulata* Poir., but Urban (Symb. Antill. viii. 281) keeps the two species distinct. Hemsley, followed by Standley, reduced *I. torulosa* Hook. et Arn. to *I. mucronata*, but an examination of the type of the former shows that it is undoubtedly distinct. *I. torulosa* has ascending or suberect torulose legumes, which are distinctly stipitate and terminate in a long acute beak (6–7 mm. long). The leaflets are acute with hairs about 0·3 mm. long. The axes of these hairs are directed outwards at an average angle of 60° with the midrib of the leaf. *I. mucronata* has reflexed non-stipitate non-torulose legumes with much shorter beaks. The leaflets are rounded or

obtuse at the apex. The hairs are 0·6–1 mm. long with axes either nearly parallel to the midrib or diverging at an angle not exceeding 45°. It is difficult to understand how the confusion between the two species arose.

**I. salmoniflora** *Rose* in CNH. v. 140 (1897); CNH. xxiii. 441.
Ymala, *Palmer* 1695.

**I. suffruticosa** *Mill.*; CNH. xxiii. 440.—*I. Anil* L.
Occurring nearly throughout Mexico (Standley).
Vernacular name "Añil."

**I. truxillensis** *H.B.K.*; Rydb. in N. Am. Fl. xxiv. 149. Sinaloa (fide Rydberg).

**Brongniartia glabrata** *Hook. et Arn.*; CNH. xxiii. 468.
Sinaloa (fide Standley).
Vernacular name "Hierba de Vibora."
The bark and leaves are used as a remedy for rattlesnake bites.

**B. Goldmanii** *Rose* in CNH. xii. 269 (1909): CNH. xxiii. 469.
Between Las Flechas and La Rastra. *Goldman* 322.
*Gonzalez* 143 from San Ignacio, R. de los de Ponce, 290 m., may be referred here, judging from Rose's description. The leaflets, however, are mucronate from an acute or obtuse apex, and the peduncles are 1·5–2 cm. long.

**Tephrosia Brandegei** (*Standley*) *Riley*, comb. nov.—*Cracca Brandegei* Standley in CNH. xx. 217 (1919); CNH. xxiii. 474.
Altata, *Brandegee*.

**T. foliolosa** (*Rydb.*) *Riley*, comb. nov.—*Cracca foliolosa* Rydb. in N. Am. Fl. xxiv. 162 (1923).
Cerro Colorado, *Brandegee* (U.S. Nat. Herb. 572117).

**Tephrosia hypoleuca** *Riley*, sp. nov.; affinis *T. nitenti* Benth., foliolis paucioribus oblanceolatis nec oblongis saepius acutis rarius retusis, subtus indumento breviori, floribus multo majoribus distincta.

*Caules* erecti sulcati, 3 mm. diametro 3 dm. infra apicem, pilis albis ascendentibus satis induti; internodia 7–12 cm. longa. *Folia* 3–7-foliolata, foliola coriacea, oblanceolata, acuta vel obtusa, raro retusa, mucronulata, 4–9·5 cm. longa, 1·2–2·7 cm. lata, terminalia semper majora, juniora supra sericea, vetustiora mox glabrescentia, subtus albido-sericea; petioluli 2–4 mm. longi, 1 mm. diametro. *Racemi* terminales vel axillares, 5–7·5 cm. longi, floribus fasciculatis. *Bracteae* lanceolatae, acuminatae, 0·7–1·3 cm. longae, 1·5–2 mm. latae, albido-pilosae. *Pedicelli* 6–7 mm. longi, sub fructu 1–1·3 cm. longi. *Calyx* campanulatus, 1 cm. longus, dentibus posterioribus e basi triangulari subulatis, sinu 4 mm. alto, dentibus anterioribus triangulari-acuminatis, sinibus 7 mm. altis. *Vexillum* 3·3 cm. longum, 2·8 cm. latum, gradatim in unguem angustatum, apice emarginatum, extra appresse pilosum; alae lamina 2·5 cm. longa 1·4 cm. lata basi truncata, ungue 4 mm. longo; carina acinaciformis, 2·9 cm.

longa, 1·1 cm. lata, apice rotundata, basi in unguem longe ac lenissime angustata. *Tubus staminalis* 2 cm. longus. *Ovarium* 2 cm. longum, appresse pilosum; stylus recurvus, 1·2 cm. longus, postice barbatus. *Legumen* recurvum, circiter 8 cm. longum, (stylo persistente excluso), 6 mm. latum, compressum, marginibus incrassatis. *Semina* 12–13.—*T. sericea* Seem. Bot. Herald, 280 (1856), a *lapsus calami* for *T. nitens* Benth. *T.* sp. (*T. nitens* Seem.?) Hemsl. Biol. i. 258; non *T. nitens* Benth. ex Seem. (1853).

Sierra Madre, *Seemann* 2192 (type in Herb. Kew).

**T. madrensis** *Seem.* Bot. Herald, 280 (1856); Hemsl. Biol. i. 258.—*Galactia marginalis* Seem. l.c. t. 61, non Benth. *Cracca madrensis* Kuntze; CNH. xxiii. 472.

Sierra Madre, *Seemann* 2186.

**T. multifolia** *Rose* in CNH. i. 320 (1895); Brandegee in Zoe, v. 201.—*Cracca toxicaria* Standley in CNH. xxiii. 473, partim, non Kuntze.

Cerro Colorado, *Brandegee*

Brandegee states that his plant is not typical, having the leaves more acuminate, and cuneate at the base. Standley reduces *T. multifolia* Rose to *Cracca toxicaria* (Pers.) Kuntze. A comparison of Palmer's no. 1364 (the type-number of *T. multifolia*) with specimens of *Cracca toxicaria* shows that the former differs in the leaflets being oblong and not oblong-lanceolate, in their more delicate texture and shorter, sparser indumentum, and in the much slenderer leaf-rhachis. It seems desirable to treat *T. multifolia* as a distinct species.

**Tephrosia pachypoda** *Riley*, sp. nov.; affinis *T. lanatae* Mart. et Gal., sed foliis longioribus 7–11-foliolatis, foliolis majoribus nec basi subcordatis, racemis longioribus et laxioribus, bracteis multo minoribus, calycis corollaeque indumento nunquam appresso, calycis dentibus haud subulato-acuminatis differt.

*Caules* sulcati, dense fulvo-pilosi, 5 mm. diametro 2 dm. infra apicem; internodia 2–3·5 cm. longa. *Folia* 2·4–2·7 dm. longa, 7–11-foliolata; foliola crasse petiolulata, elliptica vel oblongo-elliptica, 8–12 cm. longa, 2·5–5·5 cm. lata, apice obtusa vel rotundata, plerumque apiculata, basi rotundata, supra viridia, glabra, juniora pilosa, subtus dense fulvo-pilosa; petioluli laterales 4–6 mm longi, 2–3 mm. diametro; petiolulus terminalis ad 1·5 cm. longus; stipulae ovatae, apice rotundatae, 5 mm. longae, 3 mm. latae. *Racemi* ad 2 dm. longi, sub fructu ad 3 dm. longi, dense fulvo-pilosi. *Bracteae* lanceolato- vel subulato-acuminatae, 3–5 mm. longae, pilis fulvis patentibus dense obtectae. *Pedicelli* 5–6 mm. longi. *Calyx* campanulatus, 9 mm. longus, fulvo-pilosus, dentibus triangulari-acuminatis, tubo 5 mm. longo, dentibus posterioribus 2·5 mm. longis, anterioribus subaequalibus 3–4 mm. longis. *Vexillum* ungue 3 mm. longo, lamina suborbiculari 1·3 cm. longa 1·2 cm. lata apice truncata extra pilosa; alae ungue 3 mm. longo, lamina oblonga 1 cm. longa 4 mm. lata

glabra apice rotundata basi auriculata; carina ungue 3·5 mm. longo, lamina forma asciae 1·2 cm. longa 6 mm. lata. *Tubus staminalis* 1·2 cm. longus, glaber. *Ovarium* 1·2 cm. longum, pilosum, 8-ovulatum; stylus sub angulo recto inflexus, 6 mm. longus, barbatus. *Legumen* rectum, lineare, 5 cm. longum, 6 mm. latum, dense fulvo-pilosum. *Semina* compressa, ad 4 mm. longa, 3 mm. lata, brunnea, nigro-variegata.—*T. crassifolia* Seem. Bot. Herald, 280 (1856); Hemsl. Biol. i. 257, partim; non Benth.

Sierra Madre, *Seemann* 2183 (type in Herb. Kew).

**T. purpurea** (*L.*) *Pers.*—*Cracca purpurea* L.; Rydb. in N. Am. Fl. xxiv. 179.

Sinaloa (fide Rydberg).

**T. rhodantha** *Brandegee* in Zoe, v. 201 (1905).—*Cracca rhodantha* Rose; CNH. xii. 270; CNH. xxiii. 472.

Cofradia, *Brandegee*; Lodiego, *Palmer* 1619.

**T. Seemannii** (*Britten et E. G. Baker*) *K. Schum.*—*Cracca Seemannii* Britten et E. G. Baker in Journ. Bot. 1900, 17; CNH. xxiii. 473. *Tephrosia virginiana* Seem. Bot. Herald, 280 (1856); Hemsl. Biol. i. 258; non Pers.

Sierra Madre, in woods, *Seemann* 2191.
Vernacular name "Gallitos."

**T. submontana** (*Rose*) *Riley*, comb. nov.—*Cracca submontana* Rose in CNH. viii. 46 (1903); CNH. xxiii. 473. *Tephrosia leucantha* Seem. Bot. Herald, 280 (1856); Hemsl. Biol. i. 257, partim; non H.B.K.

Cerro de Pinal, fl. and fr. Dec. 1848, *Seemann* 1532.

**T. talpa** *S. Wats.* in PAA. xxii. 405 (1887).—*Cracca talpa* Rose; CNH. xxiii. 473.

Sinaloa (fide Standley).

**T. toxicaria** *Pers.*; Mart. Fl. Bras. xv. pars 1, 46, t. 8; Zoe, v. 201; Fawcett and Rendle, Fl. Jam. iv. part 2, 18; Urb. Symb. Antill. viii. 283.—*Cracca toxicaria* Kuntze; CNH. xxiii. 473.

Cofradia and Cerro Colorado, *Brandegee*.

"Surinam Poison." The plant is said to have been used in the treatment of cutaneous diseases, to have purgative properties, and to affect the heart in the same manner as digitalis. It is used as a fish-poison, and is reported to yield a blue dye.

**Gliricidia Lambii** *Fernald* in Bot. Gaz. xx. 533 (1895).

Rosario: in the valley of Rio Rosario, *Lamb* 451; also observed along the stage road between Rosario and Santiago.

Vernacular name "Cacaguananchi."

Standley (CNH. xxiii. 482) evidently considers *G. Lambii* conspecific with *G. sepium*. I have seen no authenticated specimens of *G. Lambii*, but a careful comparison of Fernald's description with material of *G. sepium* reveals so many points

of difference that it is difficult to see any reason for uniting the two species.

**G. sepium** (*Jacq.*) *Steud.*; CNH. xxiii. 482.—*Robinia sepium* Jacq. *Gliricidia maculata* H.B.K.

Sinaloa (fide Standley).

Vernacular name "Cacahuananche."

Often planted to protect cacao and coffee plantations.

**Diphysa occidentalis** *Rose* in CNH. xii. 271 (1909); CNH. xxiii. 479.

Culiacan, *Palmer* 1498.

[**D. racemosa** *Rose* in CNH. i. 97, t. 3 (1891); CNH. xxiii. 478.

Judging from the distribution given by Standley—Sonora to Guerrero and Morelos—*D. racemosa* may occur in Sinaloa.]

**D. Thurberi** (*A. Gray*) *Rydb.*; CNH. xxiii. 479.—*Daubentonia Thurberi* A. Gray. *Diphysa echinata* Rose in CNH. xii. 271 (1909).

Between Rosario and Colomas, *Rose* 1603.

**D.** sp. nov.

San Ignacio; Los Sabinos, 490 m., *Gonzalez* 258.

Conspecific with *Lamb* 520 from Acaponeta, Tepic, which was distributed as *D. racemosa* Rose. The material is too incomplete for description.

**Coursetia mollis** *Robinson et Greenman*; CNH. xxiii. 481.

Sinaloa (fide Standley).

Vernacular names "Garbancillo de la costa", "Cucablanca."

[**C. glandulosa** *A. Gray*; CNH. xxiii. 481.

According to Standley the range of this species is from Lower California and Sonora to Guerrero, hence it probably occurs in Sinaloa.]

**Willardia mexicana** (*S. Wats.*) *Rose*; CNH. i. 98; CNH. xxiii. 483.—*Coursetia mexicana* S. Wats. in PAA. xxi. 424 (1886).

Sinaloa (fide Standley).

Vernacular names "Nesco," "Palo piojo," "Taliste."

A decoction of the bark is used to destroy parasites on cows and horses.

**Cracca Edwardsii** *A. Gray*, Pl. Wright. ii. 35 (1853); CNH. i. 321.

Agiabampo, *Palmer* 787.

Standley (CNH. xxiii. 477) treats this species as a synonym of *Cracca mollis* Benth.

**Sesbania macrocarpa** *Muhl. ex Elliott*; Standley in CNH. xxiii. 477, excl. syn.—*S. macrocarpa* var. *picta* S. Wats. in PAA. xxiv. 46 (1889); CNH. i. 321; sed non *Aeschynomene picta* Cav.

Agiabampo, *Palmer* 775.

Vernacular name "Bequilla."

*Aeschynomene picta* Cav. Ic. iv. 7, t. 314 (1797), which is treated as a synonym of *S. macrocarpa* by Standley, differs

notably in the torulose pod and fewer leaflets, and should be referred to *S. aegyptiaca* Pers.

**Nissolia guatemalensis** *Rose* in CNH. v. 162 (1899); CNH. xxiii. 488.

Sinaloa (fide Standley).

**N. hirsuta** *DC.*; CNH. v. 160, fig. 22; CNH. xxiii. 488.

Culiacan, *Palmer* 1496.

**N. Nelsoni** *Rose* in CNH. v. 162, fig. 26 (1899); CNH. xxiii. 488.

San Ignacio; R. del Palmarito, 210 m., *Gonzalez* 633.

Vernacular name "Riatilla."

Standley doubts whether this is distinct from *N. fruticosa* Jacq. I see little resemblance between it and Jacquin's figure (Sel. Stirp. Am. Hist. t. 179, fig. 44; 1763).

**N. Schottii** (*Torr.*) *A. Gray*; CNH. v. 158, fig. 18; CNH. xxiii. 488.—*Chaetocalyx Schottii* Torr. Bot. Mex. Bound. 56, t. 18 (1859).

Sinaloa (fide Standley).

**Aeschynomene acapulcensis** *Rose* in CNH. v. 191 (1899); Zoe, v. 201.

Cerro Colorado, *Brandegee.*

**A. americana** *L.*; CNH. xxiii. 490.

Sinaloa (fide Standley).

**A. amorphoides** (*S. Wats.*) *Rose*; PAA. xxix. 315; CNH. i. 321; Zoe, v. 202; CNH. xxiii. 491.—*Brya amorphoides* S. Wats. in PAA. xxii. 406 (1887).

Cerro Colorado, *Brandegee.*

**A. bracteolaris** *Riley* in Kew. Bull. 1923, 115.

San Ignacio; El Coacoyol, 460 m., *Gonzalez* 586.

**A. fascicularis** *Cham. et Schlecht.*; CNH. i. 321; CNH. xxiii. 491.

Agiabampo, *Palmer* 808.

**A. fruticosa** *Rose* in CNH. v. 192 (1899); CNH. xxiii. 491.

Topolobampo, *Palmer* 204.

**A. hispida** *Willd.*; CNH. i. 321; CNH. xxiii. 490.

Agiabampo, *Palmer* 775 a. Also Sinaloa (fide Standley).

**A. petraea** *Robinson* in PAA. xxvii. 166 (1892); CNH. xxiii. 491.

Sierra Madre, *Seemann* 2189.

**A. simulans** *Rose* in CNH. v. 192 (1899); CNH. xxiii. 491.

Between Rosario and Colomas, *Rose* 1616.

**Stylosanthes viscosa** *Swartz*; Hemsl. Biol. i. 273.

Cerro de Pinal, *Seemann* 1540.

**Zornia diphylla** *Pers.*; Hemsl. Biol. i. 273; Zoe, v. 202.—*Z. reticulata* Sm.; SBH. 280.

Cerro de Pinal, fr. Dec. 1848, *Seemann* 1529. Also without locality, *Brandegee.*

**Desmodium chartaceum** *Brandegee* in Zoe, v. 202 (1905). *Meibomia chartacea* Standley; CNH. xxiii. 487.

Cerro Colorado, *Brandegee*. San Ignacio; Arroyo de los Frailes, 820 m., *Gonzalez* 747.

I have seen no authenticated specimens of *D. chartaceum*, but Gonzalez's plant agrees with Brandegee's description except that it possesses relatively narrower leaflets.

**D. gramineum** *A. Gray;* Zoe, v. 202.

Cerro Colorado, *Brandegee*.

**D. madrense** *Hemsl.* Biol. i. 282 (1879).—*D. canadense* Seem. Bot. Herald, 280 (1856), non DC.

Sierra Madre, *Seemann* 2184. San Ignacio; Cerro de la Silla, 1200 m., *Gonzalez* 732, partim.

The material received at Kew from Señor Gonzalez under No. 732 comprised two species—*D. madrense*, and an apparently undescribed species which differs in the caudate-acuminate bracts, acutely acuminate leaflets and the indumentum.

**D. orbiculare** *Schlecht.;* Zoe, v. 202.—*Meibomia orbicularis* Kuntze; CNH. xxiii. 486.

Cerro Colorado, *Brandegee*.

**D. plicatum** *Cham. et Schlecht.;* Hemsl. Biol. i. 286.—*Meibomia plicata* Kuntze; CNH. xxiii. 486.

Sierra Madre, *Seemann* 2181.

**D. rubricaule** (*Rose et Painter*) *Riley*, comb. nov.—*Meibomia rubricaulis* Rose et Painter in Bot. Gaz. xl. 145 (1905); CNH. xxiii. 486.

San Ignacio : La Nevada, 890 m., *Gonzalez* 558.

**Cicer arietinum** *L.;* CNH. v. 213.

The seeds are sold in the market at Mazatlan, according to Rose,

**Centrosema sagittatum** (*H. et B.*) *Brandegee* in Zoe, v. 202.—*Glycine sagittata* H. et B. ex Willd. Enum. Hort. Berol. 757 (1809). *Rudolphia dubia* H.B.K. Nov. Gen. et Sp. vi. 432, t. 591 (1823). *Centrosema hastatum* Benth. in Ann. Wien. Mus. ii. 120 (1838). *C. dubium* Hemsl. Biol. i. 294 (1880). *Bradburya sagittata* Rose in CNH. viii. 46 (1903); CNH. xxiii. 505.

Cofradia, *Brandegee*. Without locality, *Gonzalez* 582.

**Clitoria Ternatea** *L.;* Mart. Fl. Bras. xv. pars 1, 118, t. 31, fig. 1; CNH. v. 168.

In cultivation at Rosario, *Rose* 1598.

**Cologania angustifolia** *Kunth*, Mimos. 209, t. 58 (1819); Rose in CNH. viii. 37.

Foothills of Sierra Madre near Colomas, *Rose* 1653.

**Erythrina flabelliformis** *Kearney;* Standley in CNH. xx. 181; CNH. xxiii. 501.—*E. coralloides* Rose in CNH. i. 322 (1895), non DC.

Agiabampo, *Palmer* 771.

Vernacular name "Pioneo."

Standley (l.c.) questions whether *E. coralloides* DC. may not be

conspecific with *E. americana* Mill. or *E. flabelliformis* Kearney. In my view, Mociño and Sessé's plate 253, upon which De Candolle based *E. coralloides*, bears no resemblance to the authenticated specimens of *E. americana* or *E. flabelliformis* at Kew. I have not seen the Palmer number, but follow Standley who cites it as the latter species.

**E. occidentalis** *Standley* in CNH. xx. 180 (1919); CNH. xxiii. 500.

Mazatlan, *Rose, Standley and Russell* 13725; Rosario, *Rose* 1592, 1822; near Colomas, *Rose* 1796; Guadalupe, *Rose, Standley and Russell* 14732; Culiacan, *Brandegee*; La Rastra, *Goldman* 365.

Vernacular name "Colorín."

**Galactia incana** (*Rose*) *Standley;* CNH. xxiii. 502.—*Odonia incana* Rose in CNH. x. 102, t. 32 (1906).

Sinaloa (fide Standley). Without locality, *Gonzalez* 496.

I have seen no authenticated specimens of *G. incana*. In comparison with the plate, Gonzalez' plant differs in having somewhat narrower acuminate leaflets, a longer-clawed vexillum, alae with larger auricles, and a sericeous rather than pubescent ovary.

**Canavalia acuminata** *Rose;* Zoe, v. 202; Standley in CNH. xxiii. 494.

Culiacan and Cofradia, *Brandegee*.

According to Standley (l.c.) *C. acuminata* is known only from Manzanillo. It does not appear whether he has overlooked Brandegee's record or considers that the determination was incorrect.

**C. villosa** *Benth.;* CNH. xxiii. 495.

Sinaloa (fide Standley).

Vernacular name "Frijolillo."

**Phaseolus acutifolius** *A. Gray;* SBH. 281.

Sierra Madre, *Seemann*. Choix; Tasajera, 490 m., *Gonalez* 870.

Vernacular name "Ejotillo."

I have not seen Seemann's specimen.

**P. rubescens** *Brandegee;* Zoe, v. 203.

Common on the low lands west of Culiacan, *Brandegee*.

**Rhynchosia minima** (*L.*) *DC.;* CNH. i. 322.—*Dolicholus minimus* Medic.; CNH. xxiii. 497.

Agiabampo, *Palmer* 789.

**R. phaseoloides** (*Swartz*) *DC.*—*Dolicholus phaseoloides* Kuntze; CNH. xxiii. 497.

Sinaloa (fide Standley).

Vernacular name "Ojo de zanate."

**R. rupicola** *Brandegee* in Zoe, v. 202 (1905).

Among rocks of the highest elevations of the Cerro Colorado, *Brandegee*.

According to Brandegee the plant is so glutinous that the stems stick together when collected. He describes it as differing from most species of *Rhynchosia* in having branched racemes and in the attachment of the funicle at one end of a linear hilum.

**Eriosema diffusum** (*H.B.K.*) *G. Don;* CNH. xxiii. 495.—*Glycine diffusa* H.B.K. Nov. Gen. et Sp. vi. 420, t. 572.

Sinaloa (fide Standley).

Vernacular name "Hierba del duende."

**E. grandiflorum** (*Cham. et Schlecht.*) *Seem.;* SBH. 345; CNH. xxiii. 495.—*Rhynchosia grandiflora* Cham. et Schlecht.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1531. San Ignacio; Mesa de la Higuera, 760 m., *Gonzalez* 602.

Vernacular names "Jarilla Serrana", "Jarilla de la Sierra."

**Lonchocarpus lanceolatus** *Benth;* CNH. xx. 73, text fig. 23, t. 5, fig. C; CNH. xxiii. 513.

Ymala, *Palmer* 1433; between Rosario and Acaponeta, *Rose* 1873.

Vernacular name "Cabo de hacha."

**L. megalanthus** *Pittier* in CNH. xx. 70, fig. 19 (1917); CNH. xxiii. 513. Sinaloa (fide Standley).

**L. sericeus** (*Poir*) *H.B.K.*; CNH. xx. 82, fig. 33; CNH. xxiii. 514.

Between Rosario and Concepción, *Rose* 3268.

**Piscidia mollis** *Rose* in CNH. i. 98 (1891).—*Icthyomethia mollis* Blake in Journ. Wash. Acad. Sc. ix. 246 (1919); CNH. xxiii. 511.

Sinaloa (fide Standley).

Vernacular name "Palo blanco."

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# XXXIV.—THE BACTERIAL NODULES OF THE RUBIACEAE.

L. A. Boodle.

Trimen, in his Handbook of the Flora of Ceylon (1894, part 2, p. 349 *et seq.*), describes the leaves of *Pavetta indica* L. as having "scattered large thickened warts more prominent above than beneath." He also mentions warts on the leaves of *Pavetta angustifolia* Thw., *P. involucrata* Thw. and *P. Gleniei* Thw.

Similar warts or nodule-like thickenings occur on the leaves of some other members of the *Rubiaceae*, and it has been known for many years that these leaf-nodules contain Bacteria, Zimmermann having established this fact in 1902 (Jahrb. f. wiss. Bot., vol. 37, p. 1) with regard to *Pavetta indica*, *P. angustifolia* and two other species.

At a later date a further study of the nodules and of the Bacteria inhabiting them was made by von Faber (Jahrb. f. wiss. Bot., vol. 51, 1912, p. 285, and ibid., vol. 54, 1914, p. 243),

who made the interesting discovery that the Bacteria of the nodules are capable of fixing free nitrogen from the air. The plants investigated were four species of *Pavetta* and one species of *Psychotria* (*P. bacteriophila* Val.).

It appears that the presence of Bacterial nodules is a constant feature of those species in which they have been found, and the explanation of this is supplied by von Faber, who demonstrated the occurrence of Bacteria in the seed, between the embryo and the endosperm. The seedling is therefore infected from the first. The Bacteria establish themselves in the leaf-buds, in a gummy secretion within the stipular sheath, and infect the young leaves in the bud, entering them through certain stomata, which are formed at a rather early stage and are connected with secretory cavities in the mesophyll. In the region of each point of entry of the Bacteria, the mesophyll develops into a special enlarged lacunar tissue, the intercellular spaces of which become occupied by the Bacteria, the leaf becoming locally thickened owing to the special growth of mesophyll-tissue.

The *Bacterium* of the nodules, which has been named *Mycobacterium Rubiacearum*, was grown by von Faber in certain nutrient media, and a gain of nitrogenous material was found in the cultures, proving fixation of nitrogen by the *Bacterium*, when growing apart from its host plant. Some recent work by Rao (Agric. Journ. of India, vol. 18, part 2, 1923, p. 132) on Bacterial nodules of *Rubiaceae* confirms the fixation of nitrogen by the *Bacterium*, and deals especially with *Chomelia asiatica*, in which the nodules had not before been examined.

It is possible by suitable treatment of seeds with hot water to kill the Bacteria in them without destroying the germinative power of the seeds. In this way von Faber raised some seedlings (of *Pavetta Zimmermanniana*, Val.) free from Bacteria, and consequently without typical nodules, and afterwards induced the formation of nodules by infecting the plants from cultures of the nodule-*Bacterium*. In other experiments the efficiency of the Bacteria in the nodules in supplying nitrogenous material was made evident by comparing the condition of two lots of seedlings, one having Bacterial nodules, the other not, and both being grown on a substratum containing no nitrogenous compounds.

A relatively large amount of nitrogenous material accumulates in the nodules, as may be shown by staining them with Millon's reagent, but this accumulation may disappear from the nodules of old leaves, and apparently the Bacteria may be eventually digested by the host-plant (von Faber, loc. cit., vol. 51, p. 301).

On account of the nitrogen-fixing activity of the Bacteria and what has been noted with regard to the contents of the nodules, one may assume that the leaves (when not too old) of those species of *Rubiaceae* which have Bacterial nodules will contain a rather high percentage of nitrogenous substance. The suitability of such leaves for use as green manure therefore suggests itself, and

in this connection it appears very significant that the leaves of *Pavetta indica* are used in this way by natives in India (see von Faber, loc. cit., vol. 51, p. 336), and that leaves of the same species and of *Chomelia asiatica* " are in high esteem as green-leaf manures among the Tamil cultivators of Ceylon (northern districts) " according to Rao (loc. cit., p. 142). The leaves are gathered from wild plants in the jungle.

Foliar nodules containing Bacteria but differing in several respects from the nodules of the *Rubiaceae* occur in *Ardisia crispa* A. DC. (*Myrsinaceae*) and have been investigated by Miehe (Abh. Sächs. Ges. Wiss., vol. 32, p. 399; Jahrb. f. wiss. Bot., vol. 53, p. 1, and vol. 58, p. 29).

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## XXXV.—NOTES ON HELIOCARPUS.

T. A. Sprague.

The publication of a revision of the genus *Heliocarpus* (*Tiliaceae*) by Mr. E. E. Watson* suggests the following remarks which are based on a study of the material in the Kew Herbarium.

**H. glanduliferus** Robins. in Contrib. U.S. Nat. Herb. v. 127 (1897).—*H. americanus* Hemsl. Biol. Centr.-Amer., Bot. i. 139, partim, non L.
Guatemala: Dep. Santa Rosa; Chupadero, 1500 m. *Heyde et Lux in Donn. Smith* 3956. Volcan de Fuego; ridge above Calderas, 2490 m., *Salvin.*

Mr. Watson takes a comprehensive view of *H. glanduliferus*, and cites *H. glabrescens* Hochr. as a synonym. The latter differs at first sight from type *glanduliferus* in the practically glabrous leaves with a very narrow basal sinus and a more strongly areolate lower surface. Mr. Watson describes the indumentum of the lower surface of the leaf of *H. glanduliferus* as " varying from essentially glabrous to densely and softly stellate," and Salvin's specimen of *H. glanduliferus* from the Volcan de Fuego is admittedly somewhat intermediate as regards the indumentum. Some of the most important specific characters in *Heliocarpus*, however, are afforded by the mature fruit, which does not appear to be known in the case of *H. glabrescens*, and in the present state of our knowledge it seems premature to unite the two species.

Mr. Watson has overlooked my identification of *H. glabrescens* with *Adenodiscus mexicanus* Turcz.—not unnaturally, since it was published in the introduction to a Revision of the genus

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* Bull. Torr. Bot. Cl. 1923, pp. 109–128.

*Belotia.** The species should now be known as *H. mexicanus*. Its synonymy and geographical distribution are as follows :—

**H. mexicanus** (*Turcz.*) *Sprague* in Kew Bull. 1921, 272.—*Adenodiscus mexicanus* Turcz. in Bull. Soc. Nat. Mosc. 1846, ii. 504. *Heliocarpus glabrescens* Hochr. in Ann. Conserv. et Jard. Bot. Genève, xviii.–xix. 122 (1914). *H. americanus* Hemsl. Biol. Centr.-Amer., Bot. i. 139, partim, non L.

Mexico: Vera Cruz; woods on the Cordillera, 900 m., *Galeotti* 4154; Zacuapan, *Linden* 858; Oaxaca, *Ghiesbreght* 51.

In describing *H. glanduliferus*, Robinson cited, in addition to the type-material from Guatemala, specimens collected by E. W. Nelson in Chiapas, and others collected by A. Tonduz in Costa Rica at S. Francisco de Guadalupe, by the Rio Torres. I have not seen this syntype† material, but there are specimens in the Kew Herbarium from the same locality, named *H. glanduliferus*. These differ from type *glanduliferus* in the relatively narrower, more lanceolate leaves, in the cymes, which are opposite the foliage-leaves instead of being aggregated into a leafless terminal inflorescence, and in the flower-buds, which are more swollen above and are terminated by strongly diverging curved horns. The characters mentioned seem to warrant the treatment of the Costa Rica plant as an independent species.

**H. costaricensis** *Sprague*, sp. nov.; affinis *H. glandulifero* Robins., forma foliorum et alabastrorum necnon inflorescentia differt.

*Folia* ovato-lanceolata vel lanceolata, longe acute acuminata, basi rotundata vel inconspicue anguste cordatula, 9–12 cm. longa, 3–6 cm. lata, supra asperule stellato-pilosa, pilis praecipue biradiatis vel triradiatis nonnullis simplicibus hic inde sparsis, radiis curvato-ascendentibus, subtus densius stellato-pilosa radiis pluribus; petioli 2·5–4·5 cm. longi. *Cymae* plerumque oppositifoliae, nec inflorescentiam terminalem aphyllam efformantes. *Alabastra* in sicco circiter 5 mm. longa cornubus inclusis, inferne circiter 1·2 mm. diametro, deinde valde inflata, juxta medium ultra 2 mm. diametro; cornua valde divergentia, curvata, circiter 0·7 mm. longa. *Sepala* oblongo-linearia, 6·5–7·5 mm. longa, 1 mm. lata, cornua 0·75–1 mm. longa. *Petala* anguste oblanceolata, 4–4·5 mm. longa, 1 mm. lata vel ultra. *Stamina* circiter 40. Costa Rica: Prov. San José: banks of the Rio Torres, at San Francisco de Guadalupe, 1100 m., *Pittier in Herb. Tonduz* 13022 (*Herb. Donn. Smith* 7451).

*Heliocarpus reticulatus* Rose and *H. microcarpus* Rose, which are united by Mr. Watson, differ notably in the fruit. In the former the sides of the fruit are clothed with conspicuous plumose

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* Kew Bull. 1921, 272.

† The terms now in use for the various kinds of types are explained in Journ. Bot. 1923, 137.

bristles resembling the peripheral ones but shorter, whereas in the latter the bristles on the faces are very short or almost suppressed. The former is represented in the Kew Herbarium from Jalisco only, and the latter from Morelos only. The reasons given by Mr. Watson* for uniting the two species do not seem adequate.

**H. appendiculatus** *Turcz.* in Bull. Soc. Nat. Mosc. 1858, i. 226.

Mr. Watson cites numerous specimens from San Luis Potosi, Vera Cruz, Chiapas, and Guatemala in addition to the type, which is *Linden* 2065 from Tabasco. Mature fruit of the Tabasco plant is not known, and it is therefore difficult to determine whether the specimens from Guatemala are really conspecific. An allied species from Chontales, Nicaragua, is represented in the Kew Herbarium. This differs from the Guatemalan plant in the much smaller capsule, only 8–9 mm. wide including the bristles, and with a broadly elliptic body, rounded above, and a shorter stipe. These differences are not due to age, as the seeds are ripe in both cases. The Nicaraguan plant may be distinguished from *H. appendiculatus* (both Tabasco and Guatemala specimens) by the indumentum of the lower surface of the leaf, which has numerous relatively large fulvous stellate hairs forming a second tier above the fine greyish tomentum. It may be known as *H. chontalensis*.

**H. chontalensis** *Sprague*, sp. nov.; affinis *H. appendiculato* Turcz., staminibus paucioribus, capsula minore brevius fimbriata, indumento duplici paginae inferioris folii cognoscendus.

*Folia* late ovata, indivisa vel subtrilobata, 8–14 cm. longa, 6–11·5 cm. lata, breviter acuminata, basi leviter cordata, auriculata, auriculis lobatis, lobis nectariis terminatis, supra minute densiuscule asperule stellato-pubescentia, subtus griseo-tomentella, pilis stellatis majoribus fulvis superpositis; petioli 4–7·5 cm. longi. *Inflorescentia* densiuscula, rhachi furfuraceo-tomentosa. *Alabastra* circiter 4·5 mm. longa, haud cornuta. *Sepala* oblongo-linearia, 5·5 mm. longa, 1 mm. lata. *Petala* linearioblanceolata, 3·5–4·5 mm. longa, ungue ciliato 0·75–1 mm. longo incluso. *Stamina* circiter 25. *Capsula* cum radiis 8–9 mm. lata, 5 mm. stipitata; corpus capsulae late ellipticum, 2·5–2·75 mm. longum, 2·2 mm. latum; radii 2·5–4·5 mm. longi, circiter 52–56; setae stipitis 9–10. *Semina* 1–2.—*Heliocarpus* sp. no. 6, Hemsl. Biol. Centr.-Amer., Bot. i. 139; *H. arborescens* Hemsl. l.c., partim, non Seem.

Nicaragua: Chontales; in forests, 600 m., *Lévy* 483 (type); *Tate* 31 (384), 31 (384 ?).

Dissection of the flower-bud of *H. arborescens* Seem., which Watson has excluded from *Heliocarpus*, shows that it belongs to the genus *Triumfetta*. The globose spinose-tuberculate ovary, long slender style and small acute stigmas are characters which, taken in conjunction with the ciliate annulus surrounding the

* Bull. Torr. Bot. Cl. 1923, p. 112.

stamens, may be regarded as conclusive: The species should therefore be known as *Triumfetta arborescens* (Seem.). Its synonymy and geographical distribution are as follows :—

**Triumfetta arborescens** (*Seem.*) *Sprague*, comb. nov.—*Heliocarpus arborescens* Seem. Bot. Herald, 86 (1853); Hemsl. Biol. Centr.-Amer., Bot. i. 139, partim, excl. spec. Nicarag.
Panama: Canton of Natá; on the banks of the Rio de Santa Maria, *Seemann* 96.

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## XXXVI.—MISCELLANEOUS NOTES.

F. W. Birschel.—Among the smaller collections of dried plants included in Sir W. J. Hooker's herbarium which, along with Bentham's, formed the basis of the present Kew Herbarium, was one comprising about 200 specimens collected near Caracas, Venezuela, by F. W. Birschel. Birschel, who was a Hanoverian by birth, was employed as a gardener in the Royal Gardens, Kew, for about two years, 1852–3. He visited Venezuela in 1854—some of his specimens have signed and dated labels (e.g. *Melochia tomentosa* and *Waltheria americana*), but many are marked merely "Caracas. Birschel." On his return to England about 1855 he stayed for a few months in the Royal Gardens, Kew, and then obtained an appointment under Sir Joseph Paxton at Chatsworth, where he remained for about two years. In April 1858 he was appointed Curator of Liverpool Botanic Gardens, where he remained some two or three years. He died in Liverpool a few years later. In the collection of letters preserved in the Kew Herbarium is one from Birschel to Sir W. J. Hooker, dated April 1, 1858, asking for a testimonial in connection with his Liverpool appointment. Most of the facts as to Birschel's life are taken from a notice by the late Mr. W. B. Latham in the *Journal of the Kew Guild*, 1901, ix. 38. Mr. Latham gave Birschel's first initial as J., but the signature of the letter to Hooker is unmistakeably F. W. Birschel. Latham made Birschel's acquaintance "about 1855, on his return to Kew from a botanical mission to Brazil," and they were fellow-workers both at Kew and Chatsworth. "Brazil" is doubtless a mistake for "Venezuela."

It has seemed worth while to put on record what is known of Birschel, as his name does not appear in the "Biographical Index of British and Irish Botanists," nor in the list of collectors whose plants are in the Kew Herbarium (Kew Bull. 1901, pp. 1–80). It has sometimes been misread as "Buschel" (*cf.* Journ. Bot. 1919, Suppl., p. 23, under *Manettia calycosa*).

T. A. S.

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**Text-book of Australian Forest Botany.***—Notebooks of student-days are soon outgrown: they are bulky, possess no index and too often are far from ideal in arrangement and neat-

* An Elementary Text-book of Australian Forest Botany, by C. T. White. Vol. I. Forestry Commission, Sydney, New South Wales.

ness. Their original value is of short duration, however, and their long retention becomes unnecessary when one possesses text-books of the type of Mr. White's. This is an excellent work of reference and its clear arrangement and handy size should also commend it. This work must, however, be regarded rather as a lecture-companion and reference-book than as a "self-educator."

The book possesses 208 pages and is divided up into three sections—(1) morphology (pp. 5–119), (2) anatomy (pp. 129–143), and (3) physiology (pp. 162–208). It is to be regretted that morphology occupies more than half the book. It is not suggested that this part is too large. It is a most excellent introduction to work with a Flora. But forestry being in many of its aspects "applied ecology," and as forestry is generally conducted for the supply of wood, it seems reasonable to expect the greatest detail to be given to the most important parts—the internal structure and life processes. In the preface the author apologises—and with reason—for the abundance of terms used in the morphological section, but he makes ample amends by giving derivations of the words in the form of foot-notes and by adding a useful index. Mr. N. W. Jolly, B.A., B.Sc., contributes largely to the section devoted to physiology, and this, as well as the section on anatomy, is good, but rather too concise for the beginner and for the man trying to educate himself. On the whole the work is well illustrated by photographs and line illustrations of a helpful nature. Most of these are clear, but a few of the latter are certainly not in keeping with the high standard of the remainder of the work. The second volume will be awaited with interest. In the preface the author says it will be devoted to systematic botany, ecology and the identification of timbers. It is hoped that the importance of the tree as a wood producer will not be lost sight of, for all foresters require to know the essentials of tree life while only a few will specialise in taxonomy.

K. W. B.

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**The Botanic Gardens, Dominica.***—In *Kew Bull.* 1915, p. 311, mention was made of the Official Guide to the Botanic Gardens, Dominica. A second edition has recently been published in which the information has been brought up to date and considerably amplified, and through setting the lines more closely it has been possible to keep the Guide to a convenient pocket size. In particular the illustrations have been greatly improved not only in the manner of reproduction but in the choice of subjects.

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* Official Guide to the Botanic Gardens, Dominica, plates 10, plan, pp. 59 and xvi. Price 1*s*.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10] [1923

# XXXVII.—THE BRITISH SPECIES OF CEUTHOSPORA AND CYTOSPORINA.

W. B. Grove.

The two form-genera named above will be considered here together, because they both resemble *Cytospora**, especially in the fact that the spores can exude from the ostiole in a tendril. *Cytosporina* is separated from *Cytospora* mainly by the greater length and slightly different shape of its spores; it would, indeed, possibly be more logical if *Cytosporina* were considered merely as a subsection of *Cytospora*, were it not that its best-known members (and possibly all) belong to ascophorous genera different from those to which *Cytospora* belongs, viz., to *Eutypa* and *Cryptosphaeria*.

With regard to *Ceuthospora*, which is more divergent in form, there is a difference of opinion. Some deem the mark of the genus to reside in the straight, elongated-cylindrical, not sausage-shaped spores. But there seems to be one species, *Ceuthospora Laurocerasi*, occurring frequently on dry fallen leaves and twigs of *Prunus Laurocerasus*, which has spores as sausage-shaped as those typical of *Cytospora*, and yet this species agrees in other respects so closely with the type species of *Ceuthospora* (*C. phacidioides*) that it seems impracticable to separate them generically. Greville, recognising their close affinity, figured them for the first time, in his Scottish Cryptogamic Flora, on two successive plates. I think that the best mark of *Ceuthospora* is to be found in the possession of two kinds of pycnidia, as described below: the cylindrical spores would then serve as a subsidiary mark. It is true that not quite all the British species are known, so far, to produce both kinds of pycnidia, but that is a deficiency which time may make good. Three of the species are ascribed as pycnidial stages to the discomycetous genus *Phacidium*, and possibly all of them belong there or to allied genera. If this connection of the coelomycetous form-genera with fixed groups of ascophorous species should turn out, on

* *K.B.*, 1923, p. 1.

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further investigation, to be more widely spread and more definite (just as is the connection of *Phomopsis* with *Diaporthe*) the result would be of considerable help in practical pathological studies. It may be remarked, in passing, that in this case the genus *Gloeosporium* would have to be subdivided into several genera, a process indeed which has been already started.

## Ceuthospora.

Pycnidia or stromata of two kinds: (1) like those of *Cytospora*, but mostly unilocular only; (2) larger, flatter, more coriaceous, usually pseudolocellate within; immersed, then erumpent by a conico-truncate neck or more than one, often surmounted by a dark-brown leathery disc. Spores usually cylindrical, nearly or quite straight, hyaline, continuous, distinctly pedicellate, occasionally issuing in a tendril.

The basis on which I place this genus is the possession of two kinds of pycnidia—a smaller one resembling a *Phoma* or a *unilocular Cytospora*; and a larger one, having much the character of a sclerotium, and acting as a resting stage that can persist for several years, but sooner or later producing spores identical in form with those of the smaller pycnidia. In some of the species this occurrence of the two kinds is so obvious that it cannot be unnoticed, but in *C. phacidioides* the smaller pycnidia are apparently rather uncommon. Even in that species, however, they can be found at times, in close company with the larger ones on the same leaves and having exactly the same kind of spores and sporophores. It will be seen that some of these have long been known and described under different names, *e.g.*, *Phoma cylindrospora* on *Vinca*, *Hedera*, *Euonymus*, etc., and in at any rate some cases *Phoma leucostigma*. Many specimens (perhaps most) that are called *Cytospora foliicola* belong to the same category. It will be seen that the species of *Ceuthospora* delight in thick and coriaceous leaves, such as those of *Hedera*, *Euonymus* and *Vinca*, the very plants on which *Cytospora foliicola*, *Macrophoma cylindrospora* and *Phoma leucostigma* are wont to be recorded.

**Ceuthospora Euonymi** *Grove*, in Journ. Bot. 1916, p. 190. *Cytospora foliicola* Lib. p.p.

Pycnidia or stromata immersed, amphigenous, of two kinds: (1) unilocular, about 0·25 mm. diam., densely crowded or somewhat scattered, prominent, subglobose, black, dehiscing by a conico-truncate opening which is surrounded by the laciniae of the epidermis and exposes the furfuraceous disc; disc often tinged with rufous; (2) plurilocular, maturing later, 0·5 mm. or more in diam., scattered, round, flat, discoid, black, somewhat shining, for a long time solid and sterile, at length dehiscing by 1–4 (usually one or two, rarely four) conico-truncate openings which are often occupied at first by a similar furfuraceous disc, but are at length filled with the white mass of the abundant exuded spores. Spores alike in both, cylindrical

with rounded ends or slightly pointed below, quite straight, usually perfectly hyaline and free from guttules, 14–17 × 2–2·5 μ or sometimes smaller; sporophores straight, slender, of about the same length.

On leaves and twigs of *Euonymus japonicus*. Sussex; Middlesex; Hampshire; Cheshire; Ayrshire, etc. Sept.–Mar. Specimens of *Cytospora foliicola* var. *Euonymi* from the United States are quite different.

*Distrib.* France.

**Ceuthospora Feurichii** *Bubák*, in Annal. Mycol. 1906, iv. 115. *Cytospora foliicola* Lib. p.p.

Stromata amphigenous, somewhat uniformly scattered, black, covered by the whitish epidermis or buried deeply in the mesophyll, raising the epidermis and at length bursting it by a roundish pore, showing the white furfuraceous disc, conico-truncate, divided within into several roundish loculi, each about 200 × 150 μ; texture brown outside, paler within. Spores cylindric or cylindric-fusoid, slightly narrowed below, 9–13 × 1·5–2 μ; sporophores filiform, branched, as long as or longer than the spore.

On stems and dead or dying leaves of *Vinca minor*. Kent; Suffolk; Lanarkshire; Aberdeen. Feb., Mar. No doubt the pycnidial stage of the rare *Phacidium Vincae* Fckl.

The Aberdeen specimens have cylindrical spores, 12–15 × 2–3 μ; they show both types of conceptacles, with 1–3 furfuraceous discs, exactly similar in form to those of *Ceuthospora Euonymi*.

*Distrib.* France, Belgium, Germany, Denmark, Austria, Poland.

**Ceuthospora Hederae** *Grove*, sp. nov.

Pycnidia dimorpha: (1) alia parva, gregaria, epidermidem in 3–5 lacinias findentia, iis *Macrophomae cylindrosporae* simillima; (2) alia ampliora, planissima, durissima, coriacea, discoidea, atra vel cinereo-nigra, 0·75–1 mm. diam., in folii utraque pagina visibilia. Sporulae in omnibus pycnidiis prorsus similes, cylindricae, rectissimae, utrinque obtusae, eguttulatae (rarius minute pluriguttulatae), achroae, 12–20 × 2–3 μ, sporophoris filiformibus rectis subaequilongis vel brevioribus suffultae.

*Hab.* in foliis petiolisque emortuis *Hederae Helicis*, rarius, Edgbaston, prope Birmingham, et Shropshire, Aug., Sept.

Pycnidia majora *C. phacidioidem* in mentem revocant, minora seorsum visa *Macrophomam* simulant. Pycnidia sclerotioidea saepius sterilia invenientur; eorum incunabula nonnunquam *Asteroma Hederae* nominantur. Speciem haud disparem, in foliis *Aucubae japonicae* nidulantem, cl. Boydius benevole misit, sed exemplaria pauciora quam ut describantur.

*Distrib.* France, Belgium, Italy.

**Ceuthospora latitans** *Grove*, in Journ. Bot. 1918, p. 314. *Dothidea latitans* Fr. Syst. Myc. ii. 552. *Dothiorella latitans*

Sacc. Syll. iii. 241. Allesch. vi. 531. *Phyllachora latitans* Sacc. Syll. ii. 610.

Stromata amphigenous, immersed, roundish, then convex and erumpent, splitting the epidermis into four or five laciniae, black outside, about 0·5 mm. diam.; loculi one or several, immersed in the brownish stroma and often imperfectly divided. Spores cylindrical, straight, obtuse at both ends or somewhat tapering below, 8–10 × 1·5–2 $\mu$ (12–13 × 2 $\mu$, Sacc.).

On dry dead blackening leaves and twigs of *Vaccinium Vitis-idaea*. Shropshire; Cheviots; Ayrshire, etc. The pycnidial stage of *Phacidium Vaccinii* Fr. In its somewhat botryose pycnidia it tends outwardly towards *Dothiorella*. It is not like *C. minima* Cooke & Hark., on *Vaccinium*, U.S.A.

*Distrib.* Switzerland, Sweden, Finland.

**Ceuthospora Laurocerasi** *Grove*, in Journ. Bot. 1916, p. 191. *Sphaeria Lauri* Sow. Eng. Flor. pl. 371, f. 4 (prob.), non *S. Hederae β. Lauri* Fr. Syst. Myc. ii. 521, ut dixit Grevillius. *Ceuthospora Lauri* Grev. Scot. Crypt. Flor. t. 254. Cooke, Handb. p. 465. Sacc. Syll. iii. 279, pro parte. Allesch. vi. 616 (error). Non *Cytospora Laurocerasi* Fckl. (saltem pro parte).

Conceptacles or stromata numerous, amphigenous, of two kinds: (1) small, 0·5–1 mm. diam., obtusely conical, tending to be unilocular; (2) larger, up to 1·5 mm. long, hard, sclerotial, plurilocular or pseudolocellate, brownish-black, surmounted by the elevated leathery disc which is pierced by the protruding ostiole or sometimes split into 2–4 short erect laciniae. Spores sausage-shaped, obtuse at both ends, 4–6 × 1–1·5 $\mu$; spore-mass nearly colourless; sporophores crowded, filiform, slender, simple or somewhat branched, two to three times longer than the spore.

On dead leaves and twigs (not branches) of *Prunus Laurocerasus*. England, Wales, Scotland, Ireland. Aug.–Apr. The form on the twigs (usually dead shoots of the foregoing summer) is the so-called variety *ramulicola*; its pycnidia are always sclerotial, 1–1·5 mm. diam.

After long observations, I venture to suggest that there are on *Prunus Laurocerasus* four different fungi belonging to the genera under consideration, all having similar spores:—

1. *Ceuthospora Laurocerasi* Grove.
2. *Cytospora Laurocerasi* Fckl. p.p.
3. *Cytospora leucostoma* Sacc.
4. *Cytospora ambiens* Sacc.

Of these (1) occurs only on the leaves and small twigs; its spore-mass is almost colourless, its pycnidia leathery and of two kinds, although most are unilocular; (2) occurs on the larger branches, more rarely on the twigs and leaves; its spore-mass is almost colourless, its pycnidia are all of the smaller kind, and it belongs to *Valsa Laurocerasi* Tul.; (3) occurs on

the branches, very rarely on the leaves, it has the usual *Cytospora* pycnidia, and its spore-mass is distinctly pinkish; this belongs to *Valsa leucostoma* Fr.; (4) resembles (3) but the spore-mass is white, and the tendrils are white, though they soon turn to a pale-amber or turbid-yellow; this belongs to *Valsa ambiens* Sacc. These suggestions are only tentative, as a basis for future research; longer observation will probably reduce these species to a smaller number.

**Ceuthospora Mahoniae** *Grove*, in Journ. Bot. 1918, p. 314.

Stromata epiphyllous, gregarious, dimorphic: (1) small, 250 $\mu$ diam., with 1–7 chambers, truncate-conical, then erumpent and forming a small round whitish furfuraceous disc which is pierced by a central ostiole; (2) comparatively large, very hard, convex, prominent, solid, round or oblong, 0·5–1 mm. diam. or more, formed from the mesophyll of the leaf, blackish without, brown within, covered by the torn epidermis, then surrounded by it, enclosing 20–40 very minute round crowded loculi with white contents. Spores cylindrical, quite straight, obtuse above, eguttulate, 10–14 × 1·5–2 $\mu$.

On dead leaves of *Mahonia japonica*. Studley Castle, Warwickshire. June.

Resembling *C. Euonymi* in having two kinds of pycnidia or stromata: (1) with many loculi; (2) with few or even a single loculus, the former being later in development, though the spores are exactly the same in both. But the larger stromata of *C. Mahoniae* are quite different from anything which obtains in *C. Euonymi*.

**Ceuthospora phacidioides** *Grev.* Scot. Crypt. Flor. t. 253. Cooke, Handb. pp. 465, 753. Sacc. Syll. iii. 277. Allesch. vi. 615. Died. Pilz. Brand. ix. 322. *Phoma Ilicis* Desm. p.p.

Stromata of two kinds: (1) smaller, *Phoma*-like in appearance, but with 1–4 loculi (more or less connected) within, texture of wall like that of a *Cytospora*, splitting the epidermis into 3–4 triangular laciniae; (2) larger, 1–1·5 mm. diam., numerous, immersed, orbicular or nearly so, at first flat, pitch-black, shining, enclosing 3–7 closely combined loculi; ostiole (when perfect) in the centre of a white furfuraceous disc, surrounded by the epidermis which becomes raised in the centre to form a whitish spot, and ultimately splits into 3–5 laciniae. Spores all alike, cylindrical, usually quite straight, obtusely rounded at both ends or sometimes acute below, often granular within, 12–20 × 2–4 $\mu$, issuing in a whitish tendril; sporophores papilliform, rather short.

On dead fallen leaves of *Ilex Aquifolium*, rarely on dead twigs of the previous year. Very common, but the larger stromata are frequently sterile. The pycnidial stage of *Phacidium multivalve* K. & S.

Many, if not all, of our British specimens placed under *Phoma Ilicis* Desm. are the smaller pycnidia of *C. phacidioides*, the larger ones not having yet been formed on that leaf. My

ground for stating that these two forms of pycnidia belong to the same species is: (1) that they bear exactly similar spores; and (2) that they both continually occur together on the same leaf, an unbroken series being then often traceable from the largest to the smallest. One can, of course, find pycnidia bearing allantoid spores, and others bearing ovoid spores of various sizes, on the same leaves of Holly, often in company with the *Ceuthospora*, but in that case no one would dream of suggesting that there is any connection between them.

### Cytosporina.

Stroma *Valsa*-like, verruciform or effused, on bark or wood, hard, brown-black outside, paler within. Pycnidia more or less immersed, even emerging completely, plurilocular or pseudo-locellate, opening by one or more ostioles. Spores filiform, curved, hyaline, continuous, over 12 $\mu$ long.

The best known species are pycnidial stages of *Eutypa* and *Cryptosphaeria*, and therefore are distinct from *Cytospora* more deeply than is implied in mere length of spore. Others are assigned to *Eutypella*, but possibly in error.

**Cytosporina Acharii** *Grove*, comb. nov. *Cytospora Acharii* Sacc. Syll. iii. 267. Allesch. vi. 566. Died. *l.c.* p. 369.

Stroma widely effused, thin, black. Pycnidia partly immersed, seated on the wood, convex on a roundish base, unilocular, black, usually densely aggregated, with thick walls, opening by a narrow pore or slit. Spores filiform, curved or lunate, 13–15 $\mu$ long, at length issuing in whitish tendrils; sporophores fasciculate, about as long.

On decorticated branches, especially of *Acer*. Not uncommon. The pycnidial stage of *Eutypa Acharii* Tul. The pycnidia usually appear before the perithecia.

*Distrib.* Europe, N. America.

**Cytosporina flavovirens** *Grove*, comb. nov. *Cytospora flavovirens* Sacc. Syll. iii. 268. Allesch. vi. 566. Died. *l.c.* p. 331.

Stroma thick, more or less effused, of a greenish-yellow colour within, but nearly black outside. Loculi totally immersed, very crowded, oblong, about $\frac{1}{2}$ mm. diam., with thick fleshy indefinite greenish-yellow walls, opening by an inconspicuous pore or slit. Spores linear-filiform, curved or lunate, 30 $\mu$ long or more, nearly sessile, agglutinated, expelled in whitish tendrils which become darker with age.

On bark or wood of *Acer*, etc. Rather common. The pycnidial stage of *Eutypa flavovirens* Tul.

It has been recorded on many hosts (*e.g.*, *Fagus*, *Quercus*), and can be recognised at once, on sectioning, by the peculiar colour of its stroma, which is that of flour of sulphur mixed with a little powdered charcoal. The pycnidia, which are not abundant, come before the perithecia.

*Distrib.* Europe, N. America.

**Cytosporina millepunctata** *Sacc.* Syll. iii. 602. Allesch. vi. 953. Died. *l.c.* p. 547.

Stromata scattered, subcutaneous, minute, subglobose, pallid, mostly unilocular. Spores filiform-cylindric, variously curved, 40–48 (or even 60) × 1 $\mu$, issuing in pinkish or yellowish tendrils; sporophores very short or none.

On dead fallen branches of *Fraxinus excelsior*. Rather common. Nov., Dec. The pycnidial stage of *Cryptosphaeria millepunctata* Grev. Scot. Crypt. Flòr. pl. 201 (1826) = *Sphaeria eunomia* Fr. Syst. Myc. ii. 377 (1823) = *Valsa eunomia* Nits. (not *V. millepunctata* Nits. which is *Cryptosphaeria populina* Sacc.)—The right name would appear to be *Cryptosphaeria eunomia* Fckl. Symb. Myc. p. 212.

Both stages are common on fallen branches and twigs of Ash, but are easily overlooked on account of their minute size and subcutaneous habit. The two stages occur intermixed.

*Distrib.* Germany, Denmark.

## Doubtful Species.

**Cytosporina hysterioides** *Cooke*, in Grevill. 1887, xvi. 48. On slender twigs of *Celtis*. Kew Gardens.

This name had better be completely dropped. Cooke's own specimens show that there is no pycnidial wall, and that the pustules are composed of spores measuring 10–12 × 1·75–2·5 $\mu$.

**Cytosporina notha** *Died.* Pilz. Brand. p. 545.

On bark of branches of *Acer platanoides and A. Pseudoplatanus*. The British specimens appear to be a *Phomopsis*, possibly *Phomopsis notha* Lind, Dan. Fung. p. 422.

**Cytosporina Ribis** *Magn.* in van Hall, Annal. Mycol. 1903, i. 508. See also Brooks and Bartlett, in Annal. Mycol. 1910, viii. 174, pl. 3, f. 9.

Reported from several English counties from Kent to Hereford, on "collar" and roots of *Ribes Grossularia*. None of the specimens seen answered to the description, and the spores figured by Brooks and Bartlett have distinctly the "walking-stick" shape of a *Phomopsis* B-spore.

**Cytosporina Staphyleae** *Cooke*, in Grevill. 1887, xvi. 48.

On twigs of *Staphylea pinnata*, Kew Gardens. This does not belong to *Cytosporina*.

**Cytosporina stellulata** Sacc. Syll. iii. 602.

On branches of *Ulmus campestris*.

Said to be the pycnidial stage of *Eutypella stellulata* Nits. But this is improbable: the spermogone of this species should be *Cytospora stellulata*. The only specimens I have seen which could have been placed under *Cytosporina stellulata* were the B-spores of a *Phomopsis*, for in the same pycnidia could be found the ordinary A-spores of that genus.

# XXXVIII.—NEW EUPHORBIACEAE FROM THE MALAY PENINSULA.

H. N. RIDLEY.

In working out the Euphorbiaceae for the Flora of the Malay Peninsula, I find several species as yet undescribed, of these I herewith give descriptions.

**Cleistanthus albidiscus** *Ridl.* nov. sp.; affinis *C. parvifolio* Hk. f., sed in venatione foliorum, venis arcuantibus, bracteis hirtis, petalis integris differt.

*Arbor* parva glabra. *Folia* lanceolata, acuminata, basibus obtusis, tenuiter coriacea, subtus glaucescentia, nervis 10-paribus tenuissimis, intra margine arcuantibus, 4·5 cm. longa, 2 cm. lata; petioli 2 mm. longi vel breviores. *Stipulae* setaceae basibus dilatatis. *Flores masculi* ignoti. *Flores feminei* in glomerulis bractearum rufarum hirtarum, 1 vel 2, pedicellis filiformibus 4 mm. longis. *Sepala* valvata, 3, lanceolata. Petala 3, multo majora, ovata, apicibus rotundatis integris, 3 mm. longa. *Discus* cylindricus, albus, papillosus; ovarium glabrum ferme omnino tegens. *Fructus* ignotus.

Terutau Island, Telok Hudang, *Haniff* 1069.

Allied to *C. parvifolius* Hook. fil., of which only fruiting specimens are known. It differs, however, in the venation of the leaves, which is not inarching in *C. parvifolius*, in which the nerves break up into small branches before reaching the leaf edge. The bracts in the latter are not hairy, and the petals are toothed.

**Actephila aurantiaca** *Ridl.* nov. sp.; affinis *A. javanicae* Miq., sed in caule brevi vix ramoso, foliis latis undulatis crenatis, floribus aurantiacis differt.

*Frutex* parvus, glaber, bipedalis. *Folia* tenuiter coriacea, obovata vel oblanceolata vel elliptica, breviter obtusa marginibus crenulatis, nervis 10-paribus arcuantibus in arcubus latis marginibus distantibus, reticulationibus latis, 10 ad 17 cm. longa, 7 ad 9 cm. lata; petioli 5 ad 10 mm. longi. *Flores* parvi, vix 6 mm. lati, aurantiaci, in glomerulis in caule. *Sepala* 5, linearia, oblonga. *Petala* late obovata, denticulata. *Discus* lobis 5 planis, capillis albis tectus; ovarium conicum, glabrum. *Capsula* subglobosa, triloba, 1 cm. longa, in pedunculo 2 cm. longo.

Kelantan, on the Kelantan River at Chaning, in woods on sandy soil, *Ridley*.

**Actephilopsis** *Ridl.* nov. gen.; affinis *Actephilae* Blume, sed ovulis in loculis singulis distinguitur.

*Frutex* glaber, alabastris exceptis. *Folia* alterna, elliptica cuspidata, marginibus undulatis crenulatis, petiolis brevibus. *Flores masculi* minuti, pedicellati, in racemis densis brevibus axillaribus. *Bracteae* minutae, ovatae, acutae. *Sepala* 5, oblonga. *Petala* 5, latiora, paullo longiora. *Discus* lobis 5 sub-quadratis.

*Stamina* 3, conniventia, antheris oblongis, subsessilibus. *Pistillodium* minutum, subaequilongum. *Flores feminei* in raceme terminali, singuli in axillis bractearum lanceolatarum foliacearum. *Pedicelli* longiusculi, superne incrassati. *Sepala* 5, ovata. *Petala* 5, longiora, carnosula obtusa. *Ovarium* glabrum, triloculare, ovulis in loculis singulis; styli erecti, simplices, brevissimi. *Capsula* profundis triloba, suborbicularis. *Semina* in loculis singulis, rotundatis, flavis, brunneo marmoratis.

Species unica.

**Actephilopsis malayana** *Ridl.* nov. sp.

*Frutex* glaber, ramis cortice pallido. *Folia* tenuiter coriacea, elliptica, cuspidata, basi gradatim attenuato, marginibus undulatis crenulatis, nervis 10 ad 11-paribus gracilibus, 16 cm. longa, 9 cm. lata; petioli 1 ad 3 cm. longi. *Flores masculi* minuti, pedicellis filiformibus 4 mm. longis, in racemis brevissimis crassis in axillis foliorum et ramorum. *Bracteae* minutae, persistentes, ovatae, acutae. *Flores feminei* in racemis 19 cm. longis. *Bracteae* lineari-lanceolatae, foliaceae, 2 cm. longae, 5 mm. latae. *Pedicelli* superne dilati, 15 mm. longi. *Capsula* glabra, triloba, subrotunda, 15 mm. lata.

Pahang, Kwala Tembeling, in woods, *Ridley* 2300. Perak, Gunong Kerbau, *Haniff* 1611. Penang, Ayer hitam, at foot of hill, *Curtis* 674.

This plant has in many points resemblances to the genus *Actephila* but differs in having the ovules solitary in the ovary-cells. The male flowers are borne on short thick racemes clustered in the axils of the branches, and in leaf-axils and are very minute, while the female flowers are solitary in the axils of leaf-like bracts in a terminal raceme. They are very much larger than the males and have a dilated pedicel very much as in *Actephila*. I cannot find any genus of the one-ovuled *Euphorbiaceae* which bears any resemblance to it, and it certainly seems to have an affinity with *Actephila*, but Lieut.-Col. Gage and I myself cannot find more than one ovule in each ovary-cell or traces of a second, but I have only seen one or two female flowers. I should suggest that it really belongs to the section *Phyllantheae* but is aberrant in possessing only one ovule in each ovary-cell.

**Andrachne australis** *Dcne.*

The plant figured and described by Hooker in Icones Plantarum t. 1704 as *A. fruticosa* Linn. from Perak is not that species but *A. australis* Dcne.

**Andrachne calcarea** *Ridl.* nov. sp.; a ceteris speciebus foliis glabris obtusis basibus obtusis distinguitur.

*Herba* caule simplice raro ramoso, pubescente basi sublignoso. *Folia* membranacea, glabra, costa inferiore excepta minute pubescente rarius subtus parce hirta, elliptica vel elliptico-lanceolata, obtusa mucronulata, basi breviter angustato, nervis obscuris 4-paribus, 6 cm. longa, 2·6 cm. lata; petioli pubescentes,

1·5 cm. longi. *Flores* 1 vel 2 in axillis superioribus; masculi 2 mm. lati, pedicellis capillaribus 4 mm. longis. *Sepala* hirta, oblonga. *Petala* angusta, lanceolata. *Stamina* 5, filamentis gracilibus. *Discus* lobis linearibus profunde bifidis. *Pistillodium* mediocre. *Flores feminei* 4 mm. latae. *Sepala* ovata, extus hirta. *Ovarium* glabrum; styli 3, bifidi. *Capsula* 3 mm. lata, hirta. *Semina* semi-oblonga, grisea, transversim rugosa.

Selangor, at the top of the Batu Caves, on limestone rock, *Ridley* 8203. Lankawi Islands, Dayong Bunting, *Robinson* 6201. Siam, Kau Koh Suwan near Lampan, *Annandale* 1835.

Very distinct in its nearly glabrous blunt leaves, very shortly narrowed at the base, and its simple stem.

**Andrachne hirta** *Ridl.* nov. sp.; ab *A. fruticosa* Linn. foliis parvis hirtis distinguitur.

*Fruticula* ramosa, 28 cm. alta, undique hirsuta. *Folia* elliptico-lanceolata, obtusa vel subacuta, basi brevissime cuneata, undique dense hirta, nervis 4-paribus tenuibus, 2·5 ad 3 cm. longa, 1 ad 1·5 cm. lata; petioli hirti 1·5 cm. longi. *Flores masculi* minuti in pedicellis hirtis capillaribus 5 mm. longis. *Sepala* oblonga, obtusa, hirta, 1 mm. longa. *Petala* sepalis multo minora, spathulata, glabra. *Stamina* 5, filamentis crassiusculis superne attenuatis. *Discus* lobis linearibus acutis bifidis. *Pistillodium* breve oblongum, obtusum. *Flores feminei* 4 mm. lati. *Sepala* coriacea, extus hirta, oblonga. *Petala* breviora. *Capsula* 2 mm. lata, hirta, semiglobosa, apice plano. *Semina* grisea, transversim rugosa.

Perlis, Tebing Tinggi, near Kanga, *Ridley* 14883.

Very distinct in its small, hairy leaves and its general hairiness.

**Phyllanthus campanulatus** *Ridl.* nov. sp.; a *P. frondoso* Wall. foliis coriaceis glaucescentibus floribus majoribus campanulatis racemosis differt.

*Frutex. Folia* subcoriacea, lanceolata, acuminata, basibus angustatis, glabra subtus glaucescentia, nervis 6-paribus inconspicuis, 8·2 cm. longa, 2·2 cm. lata; petioli brevissimi. *Flores masculi* circiter 6, in racemis 2 mm. longis axillaribus. *Bracteae* parvae, lanceolatae, acuminatae. *Pedicelli* graciles, 2 mm. longi. *Sepala* 6, exteriora quam interiora angustiora, oblonga, obtusa, 2 mm. longa. *Stamina* 3, filamentis connatis, antheris liberis erectis lanceolatis obtusis. *Discus* lobis 6, obovatis latis denticulatis. *Flores feminei* et fructus ignoti.

Kedah, Kedah Peak, at 2000 feet alt., *Bell & Haniff.*

This is allied to the common *P. frondosus* Wall. but the leaves are more coriaceous and glaucescent beneath, the flowers are twice as large and campanulate in form, with distinct pedicels and borne on a very short stout raceme. In *P. frondosus* the minute flowers are nearly sessile in axillary fascicles.

**Phyllanthus erythrocarpus** *Ridl.* nov. sp.; affinis *P. dalbergioide* Wall., sed arborescens, foliis hirtis basibus latis.

*Arbor* ramulis pubescentibus. *Folia* submembranacea, ovata, obtusa, basibus rotundatis vel subemarginatis, superne glabra, subtus in nervis pubescentia, costa dense pubescente, nervis 7-paribus, 2 ad 4 cm. longa, 2 ad 4 cm. lata; petioli 3 mm. longi, hirti. *Stipulae* lanceolatae, acuminatae, persistentes, pubescentes. *Flores* in glomerulis in ramis lateralibus tenuibus circiter 9 cm. longis pubescentibus. *Bracteae* plures, lanceolatae, acuminatae. *Flores masculi* minuti, in pedicellis brevibus pubescentibus. *Sepala* 5, imbricata, oblonga, obtusa, extus pubescentia. *Stamina* 5, antheris oblongis inter loculis profunde canaliculatis, filamentis liberis brevibus. *Discus* annularis lobulatus. *Capsula* subsessilis, globosa, rubra, glabra, extus carnosa, 6 mm. longa, stylis minutis coronata. *Semina* 4, atra, triquetra.

Selangor, Batu Caves, in woods on limestone rocks, March 1915, *Ridley*.

Allied to *P. dalbergioides* Wall., but a tree, and with hairy shoots and leaves, the latter broad-based and often slightly emarginate or retuse at the base.

**Phyllanthus Hullettii** *Ridl.* nov. sp.; affinis *P. gomphocarpo* Hk. f. sed foliis minoribus confertis oblongis differt.

*Frutex* ramis rufo-furfuraceis. *Folia* membranacea-coriacea, glabra, oblonga, subacuta oblique, basibus angustatis, subtus glaucescentia, nervis inconspicuis 7-paribus, 3 cm. longa, 1 cm. lata; petioli 1 mm. longi rufo-furfuracei. *Stipulae* brevissimae, lanceolatae, acuminatae, rufo-furfuraceae. *Flores masculi* 2 mm. lati, atro-rubentes, pedicellis 3 mm. longis. *Sepala* 4, ad basin connata, ovata, rubra, fimbriata, fimbriis albis, extus hirta. *Stamina* 4, filamentis brevissimis, antheris subglobosis. *Flores feminei* rubri, 5 mm. lati, pedicellis furfuraceo-hirtis 14 mm. longis. *Sepala* 5, oblongo-lanceolata, obtusa, fimbriata, costa media superne elevata, rubra. *Discus* lobis 5 carnosis oblongis subquadratis truncatis. *Ovarium* semiglobosum, canaliculis 6; styli breves recurvi 6.

Malacca, at the top of Mount Ophir, *Hullett* 752 (in Herb. Kew).

This is evidently allied to *P. gomphocarpus* Hook. fil., of which it has the peculiar red scurf on the branches, petioles and inflorescence. The habit of the plant recalls that of *P. frondosus* Wall. The much smaller blunt, close leaves distinguish it readily from *P. gomphocarpus*.

**Glochidion glaberrimum** *Ridl.* nov. sp.; a *G. brunneo* Hk. f. in cymis sessilibus, stylo multo longiore, capsula minore differt.

*Frutex* vel arbor 10 ad 15 pedes alta. *Folia* oblique oblonga, obtuse breviter acuminata basibus breviter angustatis, subcoriacea, glabra, nervis inconspicuis 9-paribus, 10 cm. longa, 3·2 cm. lata; petioli 5 mm. longi. *Flores masculi* ignoti. *Flores feminei* in cymis sessilibus pauci, breviter pedicellati, glabri. *Sepala* coriacea, ovato-lanceolata, acuminata. *Ovarium* glabrum, aequilongum; stylus cylindricus, apice dilatato sepalis

multo superans; stigmata 3, ovata, obtusa. *Capsula* orbicularis, haud lobata, apice plano, glabra, costata, 7 mm. lata.

Perlis, Kanga, *Ridley* 14899.

Allied to *G. brunneum* Hook. fil., but the cymes are sessile, not peduncled, the style much longer, and the fruit round with a flattened top and smaller.

**Glochidion pedunculatum** *Ridl.* nov. sp.; a *G. brunneo* Hk. f. in floribus hirtis, cymis pedunculatis differt.

*Arbor* ramulis glabris. *Folia* membranacea, oblique oblonga, breviter abrupte obtuse cuspidata, basibus cuneatis, glabra, nervis 8-paribus tenuibus, 12 cm. longa, 4·8 cm. lata; petioli 5 mm. longi. *Cymae* axillares pubescentes, in pedunculis 1 cm. longis glabris. *Stipulae* et bracteae lanceolatae, acuminatae, hirtae, 3 mm. longae; bracteae breviores. *Flores masculi* ignoti. *Flores feminei* pauci, congesti, pedicellis brevissimis. *Sepala* 6, oblonga, coriacea, hirta, 2 mm. longa. *Ovarium* semi-ovoideum, hirtum; stylus sepalis aequilongus, conicus, hirtus; stigma pulvinare lobatum. *Capsulae* ignotae.

Singapore, Bukit Timah, *Ridley* 8952.

This is allied to *G. brunneum* Hook. fil. but the flowers are hairy.

**Glochidion stylosum** *Ridl.* nov. sp.; a *G. sericeo* Hk. f. foliis subtus glaucescentibus, nervis hirtis, stylis longioribus differt.

*Arbor* parva, partes juvenes hirti. *Folia* coriacea, haud glauca, oblique lanceolato-oblonga, acuminata, basibus latis, superne glabra costa hirta excepta, subtus nervis 7-paribus et costa hirtis, 4·5 cm. ad 8 cm. longa, 1·5 ad 3·5 cm. lata; petioli 3 mm. longi, hirti. *Flores masculi* pauci, axillares, fasciculati, in pedicellis 3 mm. longis pubescentibus. *Bracteae* ovatae, pubescentes. *Sepala* oblonga, obtusa, subaequalia, dorsis hirtis. *Flores feminei* sessiles. *Sepala* ovata, acuta, pubescentia. *Ovarium* dense hirtum; styli filiformes, 3, glabri, 6 mm. longi. *Capsula* rotundata, puberula, 5 mm. longa. *Semina* subreniformia, dorsis rotundatis rubra.

Selangor, Semangkok Pass at 4000 feet alt., *Ridley*.

Allied to *G. sericeum* Hook. fil. but the leaves are glaucescent or silky-pubescent on the back and hairy on the nerves, more coriaceous and lanceolate in shape, and the styles much longer.

**Glochidion trilobum** *Ridl.* nov. sp.; *G. microbotryde* Hk. f. affinis sed pubescens, pedunculis femineis multo longioribus pedicellis brevibus seminibus minoribus.

*Arbor*, ramulis tenuiter pubescentibus. *Folia* membranacea vel subcoriacea, oblique oblongo-lanceolata, obtuse acuminata, superne glabra, costa pubescente excepta, subtus costa et nervis 7-paribus tenuibus tenuiter pubescentibus, 10 ad 12 cm. longa, 4 ad 6 cm. lata; petioli 5 mm. longi, pubescentes. *Flores masculi* ad 8, in fasciculis axillaribus parvis, pedicellis gracilibus pubescentibus. *Sepala* 3, exteriora linearia oblonga obtusa recurva, interiora 3 glabra patentia similia. *Antherae* breviores

in conum connatae. *Flores feminei* ignoti. *Capsulae* in fasciculis axillaribus ad 12 in pedunculis pubescentibus brevibus, pedicellis gracilibus pubescentibus 5 mm. longis, obcordatae, trilobae apicibus depressis, pubescentes, 4 mm. latae; stylo brevi pulvinato; sepalis brevibus oblongis. *Semina* 3, rubra, nitentia, dorsis rotundatis.

Singapore, Botanic Gardens, in the forest, *Ridley* 8440. Negri Sembilan, Tampin, *Burkill* 7004.

It differs from the allied *G. microbotrys* Hook. fil. which is quite glabrous, in the female peduncles which are much longer, the pedicels quite short, and the seeds also much smaller.

**Drypetes pendula** *Ridl.* nov. sp.; a ceteris speciebus in foliis maximis oblongis crasse coriaceis ramis pendulis differt.

*Arbor* 40 ad 60 pedalis ramis longissimis pendulis. *Folia* coriacea, crassa, rigida, lineari-oblonga, subacuta, basibus inaequaliter cordatis, nervis 20 ad 30 paribus elevatis, 28 ad 56 cm. longa, 10 ad 13 cm. lata; petioli crassi, 1·5 cm. longi. *Flores masculi* in ramis in fasciculis densis 4 cm. latis multifloris, pedicellis crassis 1·5 cm. longis. *Sepala* 5, glabra, rotundata, concava. *Stamina* plurima, circum discum planum. *Stigmata* tri- vel bifida. *Fructus* globosus, 4 cm. in diametro, aurantiacus, subtrigonus, parce tomentosus.

Singapore, Garden Jungle; Selitar, *Ridley*. Selangor, Kuala Lumpur. Perak, Larut, *Kunstler* 3540. Penang Hill, *Maingay* 1453.

This very striking tree seems to have been referred by Hooker in Fl. Brit. Ind. 5 : 341 to *Cyclostemon longifolius* Bl. from which it is quite distinct. Pax in the Pflanzenreich has quite overlooked it. It is remarkable for its very long pendulous branches, and very large, thick, oblong, dark green shining leaves, bright red when young.

**Drypetes riparia** *Ridl.* nov. sp.; a *D. sumatrana* Miq. in foliis majoribus integris, fructu majore flava-pubescente differt.

*Arbuscula*, partibus juvenibus pubescentibus, ramis vetustis cortice albo tectis. *Folia* tenuiter coriacea, glabra, integra, lanceolata, acuminata, basibus angustatis inaequilateris, nervis 10-paribus tenuibus, paullo subtus elevatis, inter se arcuantibus, nervulis cum reticulationibus aeque elevatis conspicuis, 16 cm. longa, 4 cm. lata; petioli rugosi, parce puberuli, 6 mm. longi. *Flores* ignoti. *Fructus* oblongo-globosus, bisulcatus, bilocularis, 2 cm. longus et latus, pubescentia flavescente tectus, pedicello validulo 2 mm. longo, sepalis rotundatis hirtis.

Kelantan, Kwala Lebir river near the rapids, Jeram Panjang, on the banks among rocks, *Ridley*.

A willow-like tree allied to *D. sumatrana* Miq. but with larger, entire, not crenulate, leaves and larger yellow pubescent fruit. I could find no flowers on any of the trees and have seen no other specimens.

**Antidesma hirtellum** *Ridl.* nov. sp.; prope *A. longipede* Hk. f. sed drupis multo minoribus, pedicellis gracilibus multo longioribus.

*Arbor* parva ad 15 pedes alta, ramulis et partibus juvenibus flavescente-hirtis. *Folia* tenuiter coriacea, superne glabra costa pubescente excepta, subtus subglabra, elliptica, cuspidata, basibus inaequilateralibus obtusis, nervis 11 ad 12-paribus tenuibus, 19 cm. longa, 9 cm. lata; petioli hirti, 5 mm. longi. *Stipulae* lanceolatae, caudatae, hirtae, 1·5 cm. longae. *Flores* ignoti. *Drupae* in racemo simplici 45 cm. longo pubescente, ovoideo-oblongae, complanatae, sparse hirtae, reticulationibus paucis, stigmatibus terminalibus. *Bracteae* minimae, lanceolatae, hirtae. *Pedicelli* gracillimi, remote 1 cm. longi. *Sepala* ovata, acuta, dense hirta.

Perak, Bujong Malacca, in woods on the hills, *Ridley* 9581.

Allied to *A. longipes* Hook. fil., but the fruits are very much smaller.

**Croton calcicola** *Ridl.* nov. sp.; a ceteris speciebus tomento stellato-hirsuto distinguitur.

*Frutex* 2·5 m. alta, ramis dense stellato-hirsutis. *Folia* membranaceo-chartacea, superne glabra, costa excepta, subtus stellato-hirsuta (folia juvenilia undique hirsuta) elliptico-oblonga, acuta, basibus angustatis obtusis breviter bilobis, marginibus minute glanduloso-denticulatis, nervis 12- ad 13-paribus gracilibus subtus elevatis, 19 ad 24 cm. longa, 6·5 ad 8 cm. lata; petioli dense stellato-hirsuti, 4 cm. longi. *Flores masculi* ignoti. *Flores feminei* in racemo erecto 20 cm. longo dense stellato-hirsuto, pedicellis crassis hirsutis 3 mm. longis. *Sepala* ovato-triangularia, extus hirta, 3 mm. longa. *Ovarium* dense hirsutum; styli graciles, bifidi, juxta bases glabri. *Capsula* 1 cm. longa, coccis tenuibus lignosis extus dense pubescentibus. *Semina* ovoidea, apicibus rotundatis, nigra, 5 mm. longa.

Selangor, Kanching, on limestone rocks, *Ridley*. Borneo, Sarawak, *Beccari* 3134.

This shrub is distinguished from all Malay peninsula species by its soft dense tomentum of stellate hairs which covers all of it except the inner surface of the sepals, the styles and the upper surface of the leaves.

**Trigonostemon salicifolius** *Ridl.* nov. sp.; affinis *T. indico* Muell. Arg. sed foliis angustis lanceolatis acuminatis, disco brevissimo differt.

*Frutex* glabra, 1 m. alta. *Folia* coriacea, anguste lanceolata, longe-acuminata, basibus paullo angustatis, nervis tenuibus inconspicuis late arcuantibus horizontalibus 14-paribus, 14 ad 18 cm. longa, 2 cm. lata; petioli graciles 2 ad 4 mm. longis. *Racemi* axillares, 5 cm. longi. *Flores* dissiti, pauci, 6 mm. lati, pedicellis crassiusculis 3 mm. longis. *Bracteae* parvae, ovatae, obtusae. *Flores masculi*; sepala rotundata, coriacea, marginibus ciliatis; petala multo longiora, lata, rotundata, integra, kermesino-purpurea, carnosa; staminum columna brevi;

antherae 5, oblongae, apicibus bifidis; discus brevis cupulatus. *Flores feminei*; sepala brevia coriacea; ovarium trilobum, pubescens; styli corniformes, breves, bifidi. *Capsula* oblongo-ovata, tenuiter lignosa, griseo-atra, pustulata, 6 mm. longa.

Selangor, Kanching, on limestone rocks, *Ridley*.

Allied to *T. indicus* Muell. Arg. but very distinct in its narrow leaves and very short disc.

**Macaranga quadricornis** *Ridl.* nov. sp.; affinis *M. cornuta* Muell. Arg. et *M. Hosei* Hk. f. sed cornubus capsulae brevibus, folioque trilobo differt.

*Arbor* parva. *Folia* magna, 28 cm. longa, triloba, peltata, lobis lanceolatis acuminatis glanduloso-denticulatis, lobo medio 14 cm. longo, 10 cm. lato, nervis 12; lobis lateralibus 9·5 cm. longis 6 cm. latis, nervis cum costa subtus hirtis, nervulis transversis parallelis, elevatis; petioli 14 ad 18 cm. longi utrinque incrassati. *Flores* ignoti. *Fructus* in glomerulis in paniculis ramis tribus crassis 7 cm. longis, ramis 2 cm. longis glomerulis 2 cm. in diametro. *Capsulae* sessiles, glabrae, turbinatae, 15 mm. latae, apicibus applanatis, cornubus 4 glandulosis brevibus ad angulos. *Sepala* lata rotundata. *Semina* ellipsoideo-globosa, arillo rubro, 5 mm. in diametro.

Selangor, Semangkok pass, Bukit Telaga, in woods in the mountains, *Ridley*; Telok reserve, Klang, *Burkill* 6557.

Apparently allied to *M. cornuta* Muell. Arg. which however has the horns of the fruit as long as the body of it, and also allied to *M. Hosei* Hook. fil. but the leaves are trilobed. The fruits are much larger than those of *M. triloba* Muell. Arg.

**Macaranga robiginosa** *Ridl.* nov. nom. This common lowland tree in the Malay peninsula was originally called "*Rottlera montana* Heyne, in Sched," by Baillon, Études Gén. Euphorb. 230 (1858), but Heyne's *Rottlera montana* in Sched. Wallich's Catalogue 7833, is not this plant at all but a Nepal species allied to *Mallotus philippinensis*. The specimen of the Malay peninsula plant in Wallich's herbarium is numbered 7835, and the ticket merely says Penang. Mueller Arg. in DC. Prod. xv. 2, 1005 followed Baillon and called it *M. javanica* var. *montana* Hook. In the Flora of British India v. 451, it is called *M. javanica* from which species it differs entirely in the large toothed bracts, which are smaller and entire in *M. javanica*. Pax, Pflanzenreich, iv, 147, vii, 321 (1914) calls it *Macaranga montana* (Heyne) Pax and Hoffman, but it is not Heyne's plant at all. Moreover, *Macaranga montana* Pax is anticipated by *Macaranga montana* Merrill a Philippine plant, Phil. Journ. vii. 394 (1912), for which Pax has substituted the name *M. Merrilliana* (Pflanzenreich l.c. 334). This latter name must be relegated to a synonym (*M. montana* Merrill being older than *M. montana* Pax), and as Hooker's *Macaranga javanica* var. *montana* has no name, I propose *M. robiginosa* for it in reference to its rusty appearance. Pax refers it curiously to an affinity with *M. populifolia* Muell. Arg. with which it has little in

common. It is allied to *M. javanica* Muell. Arg. and *M. bancana* Muell. Arg.

**Cephalomappa penangensis** *Ridl.* nov. sp.; a *C. Beccariana* Baill. in foliis majoribus dentatis, capitulis majoribus differt.

*Frutex* magna vel arbor alta ramulis velutino-furfuraceis. *Folia* elliptica vel obovata, cuspidata, tenuiter coriacea, marginibus parce dentatis, nervis 7-paribus subtus elevatis et furfuraceis pubescentibus, nervuli transversis dissitis, 14 ad 19 cm. longa, 6·5 ad 10 cm. lata; petioli 4 cm. longi, velutini, apicibus incrassati. *Paniculae* axillares, 3 cm. longae, stellato-tomentosae. *Capitula mascula* 6 mm. diametro in pedicellis gracilibus 1 cm. longis. *Calyx* turbinatus, 3- ad 5-lobatus. *Stamina* 5, filamentis validulis liberis. *Flores feminei* 2 mm. longi. *Sepala* acuminata. *Stylus* singulus. *Capsula* 1·5 cm. longa, rufo-tomentosa, processubus conico-cylindricis.

Penang, back of West Hill, *Curtis* 3584 and 1571.

Allied to the only other species *C. Beccariana* Baill. of Borneo, but with much larger toothed leaves and larger flower heads. Curtis describes one of his plants (3584) as a tall tree, the other as a large shrub.

**Tragia laevis** *Ridl.* nov. sp.; differt a totis speciebus asiaticis in foliis angustis hastatis superne laevibus.

*Suffrutex* scandens involvens, gracilis, pubescens vel capillis urticantibus armata. *Folia* herbacea, deltoideo-hastata, acuminata, mucronulata, basibus cordatis, marginibus integris vel sparse serratis, et ad basin obscure lobatis, superne glabra brevia vel sparse albo-ciliata, subtus in nervis pilis albis urticantibus tecta, nervis 7 a basi et 6 e costa exortis, 6 cm. longa, 3·5 cm. lata; petioli pilis urticantibus muniti, 4 cm. longi. *Racemi* foliis oppositi 2 cm. longi. *Flores masculi* terminales, 3 mm. lati, in pedicellis 3 mm. longis. *Bracteae* lineares. *Sepala* 3, ovata, velutino-puberula. *Discus* annularis, papillosus. *Stamina* 3, filamentis brevibus crassis; antherae loculis 2 connectivo crasso divulsis. *Flos femineus* ad basin racemi. *Sepala* quam in masculo majora, integra, viridia, oblonga, obtusa, basi angustato, albo-pilosa. *Discus* nullus. *Ovarium* pubescens; stylus crassus, brevis, brachiis 3 carnosis recurvis, papillis crassis in margine superiore munitis. *Capsula* triloba, rufo-brunnea, pubescens, 6 mm. in diametro.

Lankawi islands, Dayong Bunting, *H. C. Robinson* 6200. Flowers greenish, stings but not badly.

This species is quite unlike any in Asia in its smooth nearly glabrous upper-side of the leaves, which are narrow and hastate.

**Cnesmone subpeltata** *Ridl.* nov. sp.; differt a *C. javanica* Bl. foliis tenuibus glabris peltatis, racemis et planta tota gracilioribus.

*Suffrutex* virgatus, gracilis, scandens, undique breviter albo-pilosus. *Folia* membranacea, elliptica vel ovata, obtusa, basibus breviter peltatis, marginibus crenulato-sinuatis, superne parce

hirta, subtus hirtiora, praesertim in nervis 4-vel 5-paribus, 5 ad 7 cm. longa, 2·5 ad 5 cm. lata; petioli 4 cm. longi, hirti. *Stipulae* late ovatae, ferme glabrae. *Racemi* gracillimi, hirti, 6 cm. longi. *Bracteae* ovatae, acuminatae, dissitae, 2 mm. longae. *Flores masculi* 4 mm. lati in pedicellis brevibus. *Sepala* 3, ovata, hirta. *Discus* nullus. *Stamina* 3, filamentis brevissimis, loculis antherae connectivo lato utrinque carinato et ad apicem prolongato divulsis. *Flores feminei* non visi. *Capsula* parva, sepalis lanceolatis acutis 6 mm. longis.

Selangor, Batu Caves in thickets, *Ridley*.

This is quite unlike the common species *Cnesmone javanica* Bl. in its much thinner, more glabrous, peltate leaves and more slender racemes.

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# XXXIX.—ADDITIONS TO THE FLORA OF THE FALKLAND ISLANDS.

C. V. B. Marquand.

In 1912 Mrs. Elinor F. Vallentin presented to Kew a collection of some 930 specimens of plants, including Cryptogams, collected in the West Falkland Islands. Mrs. Vallentin had been a resident in the Falkland Islands for a number of years and her former collections formed the basis of Mr. C. H. Wright's paper published in the Journal of the Linnean Society for 1911 (Vol. xxxix). The later collection was made in 1910 and 1911 and it was during this period that Mrs. Vallentin prepared the beautiful drawings which figure in her work, "Illustrations of the Flowering Plants and Ferns of the Falkland Islands".

In working out the Phanerogams, Vascular Cryptogams and Charophyta a number of interesting species have been met with which were unrecorded hitherto from the Falklands, and several others which confirm earlier records upon which some doubt has been cast by Skottsberg, in his "Botanical Survey of the Falkland Islands", owing to their not having been found during recent years. The present paper gives an enumeration of these additions.

Another interesting collection which was made by Dr. A. W. Hill in November 1902 and includes species from near Port Stanley, East Falklands, has also recently been determined. This collection contains a specimen of *Senecio vulgaris* L., which has hitherto been unrecorded, but it seems probable that it is a recent introduction, possibly existing only as a "casual".

With the exception of Skottsberg, who traversed the Islands in one or two directions, most of the collections so far made in the Falklands have been from the neighbourhood of the coast. The majority of the specimens in Mrs. Vallentin's collection came from the districts around Shallow Bay and Byron Sound.

Hooker recorded 125 species in 1847, Wright listed 156 species in 1911, while 163 was the total included by Skottsberg in his

work cited above which was published in 1913. In Mrs. Vallentin's last collection from a small area in the West Falklands no less than 135 species are represented. In all probability more extensive botanizing, especially of parts of the northern promontory of the West Island and on the hills inland which have not been explored botanically, would add more species to the list which is now brought up to a total of 176.

Some of the species enumerated below have almost certainly been introduced into the Islands in recent times, but this is unlikely in the case of others such as the two Filices, and an extension of their range of distribution to this Southern Archipelago is undoubtedly interesting.

Those species hitherto unrecorded from any part of the Falkland Islands are marked † in the following list. All the localities are in the West Islands except where otherwise stated.

**Draba falklandica** *Hook. fil.*

Close to the beach by Crooked Inlet. (Confirmation of doubtful record.)

† **Medicago minima** *Lam.*

Dumore Head.

† **Geranium intermedium** *L.*

Shallow Bay and Byron Sound.

† **Erodium cicutarium** *L'Hérit.*

Fox Bay. (There is, however, a specimen in the Kew Herbarium from the Islands, but its precise locality is not stated, *L. H. Firmin,* November 1896.)

† **Gnaphalium luteo-album** *L.*

West beaches, Shallow Bay.

† **Senecio vulgaris** *L.*

Near Shallow Bay, *E. F. Vallentin*; East Falklands, near Port Stanley, *A. W. Hill.* (Probably a recent introduction.)

† **Ornithogalum caudatum** *Ait.*—*Isolepis magellanica* Gaud. *I. pygmaeus* Kunth var. *brevis* Brongr.

Lake Salivan near Fox Bay. Also an earlier specimen exists in the Kew Herbarium Coll. *E. F. Vallentin,* but without exact locality.

† **Potamogeton linguatus** *Hagström.*

Fish Creek Stream, Shallow Bay; Pond, Port North; Teal River Pond.

**Scirpus riparius** *Presl.*

Excellent specimens of this fine species, which is new to the West Falklands, were obtained in profusion in one locality. It is recorded by Skottsberg from one locality also in the East Falklands, and there very rare.

**Uncinia brevicaulis** *Thouars* var. **maclovianus** (*Gaud.*) *Kuck.*

Confirmation of Gaudichaud's old record.

† **Avena fatua** *L.*
Valley near Shallow Bay Settlement; growing in profusion. Doubtfully introduced.

† **Phleum pratense** *L.*
Probably introduced, no precise locality specified.

† **Hordeum jubatum** *L.*
St. George's Bay.

† **Scolopendrium vulgare** *Sm.*
Cave, Mount Phelomel, *Chartres*.

† **Gymnogramme leptophylla** *Desv.*
Carcass Island.

† **Nitella opaca** *Agardh.*
Shallow Bay Pond.
Specimens of *Nitella* from two other localities may possibly belong to another species, but owing to the absence of oogonia and antheridia they could not be determined with certainty.

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# XL.—DECADES KEWENSES

## Plantarum Novarum in Herbario Horti Regii Conservatorum.

## DECAS CVIII.

1071. **Orophea salacifolia** *Hutchinson* [Anonaceae–Miliuseae]; affinis *O. hastatae* King, sed foliis breviter et abrupte acuminatis, floribus subsolitariis fere sessilibus differt.

*Arbor* parva; ramuli leviter flexuosi, demum glabri, internodiis 1–2 cm. longis. *Folia* late oblongo-elliptica, breviter et abrupte acuminata, basi rotundata, 8–10 cm. longa, 4–5 cm. lata, chartacea, opaca, glabra; nervi laterales utrinsecus 8, a costa sub angulo 55° abeuntes, marginem versus evanidi; petioli circiter 3–4 mm. longi, parce pubescentes. *Flores* subsolitarii, fere sessiles, axillares. *Sepala* late triangularia, acuminata, 2·25 mm. longa et lata, appresse pilosa. *Petala* exteriora sepalis similia sed duplo longiora, extra pilosa, interiora paullo longiora, unguiculata, superne conniventia. *Antherae* curvatae, connectivo brevissime producto. *Carpella* glabra. *Fructus* non visus.

Andaman Islands. Betapuo valley, 1 Apr. 1916, *C. E. Parkinson* 1156.

1072. **Calliandra confusa** *Sprague et Riley* [Leguminosae—Ingeae]; affinis *C. calothyrso* Meissn., quacum hucusque confusa, foliolis pro rata multo angustioribus conspicue haud obscure 1-nerviis, calyce satis dentato differt.

*Arbor* 4–6 m. alta. *Rami* exstantes fertiles, recti, striati, glabri vel glabrescentes, 7 mm. diametro 4 dm. infra apicem.

*Folia* circiter 1·7 dm. longa, rhachi continue subalata glabra; pinnae circiter 15-jugae, 1–1·3 cm. remotae, rhachillis superne puberulis; foliola 50–60-juga, linearia, recta, apice obtusa vel subacuta, basi truncata, costa utrinque conspicua, 6–8 mm. longa, 1–1·5 mm. lata, glabra, margine appresse-ciliolato excepto. *Inflorescentia* elongata, 2–3 dm. longa. *Bracteae* lanceolato-lineares, obtusae, conspicue striatae, circiter 8 mm. longae, 1 mm. latae, glabrae, leviter ciliolatae. *Pedunculi* gemini, 8 mm. longi, glabriusculi; pedicelli 3–4 mm. longi. *Alabastra* globosa. *Calyx* inaequaliter 5-dentatus, 1·5–2 mm. longus, glaber, dentibus late triangulatis obtusis, sinibus circiter 0·75 mm. altis. *Petala* (primo ad medium coalita mox libera) oblongo-lanceolata, obtusa vel subacuta, 5 mm. longa, fere 2 mm. lata, glabra. *Stamina* 4 cm. longa, inferne in tubum 1·5 mm. longum coalita. *Ovarium* basi annulo crasso carnoso 1 mm. alto cinctum, quadrangulatum, brevissime stipitatum, 3 mm. longum, glabrum, 10-ovulatum. *Legumen* circiter 8 cm. longum, 5–6 mm. latum, in basin gradatim angustatum, apice oblique cuspidatum, appresse ferrugineo-pilosum, marginibus valde incrassatis.—*Anneslia Calothyrsus* Donnell Smith Enum. Pl. Guat. i. 10 (1889), non *Calliandra calothyrsus* Meissn. *C. grandiflora* Hemsl. Biol. i. 357, partim, non Benth.

CENTRAL AMERICA. Guatemala: Alta Vera Paz; Cobán, 1200 m. *Tuerckheim* 690 (type in Herb. Kew); llanos at base of Volcan de Fuego, *Salvin and Godman* 210; Retaluleu, *Bernoulli and Cario* 1253.

*Calliandra calothyrsus* Meissn. was discovered by Kegel in 1846, in woods by the Saramacca River, near Maripaston-kreek, Surinam, and does not appear to have been collected since (Pulle, Enum. Vasc. Pl. Surinam, 205; 1906). It is described as having oblong obscurely 1-nerved leaflets, 2 lin. long and hardly ⅔ lin. broad, and a very shortly 5-toothed calyx, characters which definitely exclude the Guatemalan species.

1073. **Calliandra similis** *Sprague et Riley* [Leguminosae-Ingeae]; similis *C. confusae* Sprague et Riley, sed pinnis foliolisque paucioribus et minoribus, rhachi inflorescentiae hirsuta, alabastris obovoideis haud globosis, annulo perigyno tenui haud crasso differt.

*Caules* ramosi, rugosi, cinerei, sparse pilosi, 3·5 mm. diametro 3 dm. infra apicem, novelli nigrescentes, striati, vix rugosi, versus apices pilis fulvis obtecti. *Folia* 6–8 cm. longa, pulvino conspicuo, rhachi sulcata sparse pilosa; pinnae 9–11-jugae, 5–7 mm. remotae, rhachillis minute pilosis; foliola circiter 30-juga, oblonga, apice obtusa, basi subauriculata, costa conspicua, 2·5–4 mm. longa, 0·5–1 mm. lata, glabra margine sparse ciliolato excepto. *Stipulae* lanceolato-acuminatae, 3 mm. longae. *Inflorescentia* satis elongata, circiter 1·4 dm. longa, sparse hirsuta. *Pedunculi* 2–3-fasciculati, 7–8 mm. longi; pedicelli 2·5–3 mm. longi. *Alabastra* obovoidea. *Calyx* cupularis, breviter 5-dentatus, vix 2 mm. longus, glaber, dentibus e basi lato triangulatis obtusis

circiter 0·5 mm. altis minutissime ciliolatis. *Petala* elliptico-ovata, obtusa vel subacuta, 6 mm. longa, 3 mm. lata, glabra. *Stamina* circiter 3 cm. longa, inferne in tubum 1·5 mm. longum coalita. *Annulus* 2 mm. altus, tenuis. *Ovarium* brevissime stipitatum, quadrangulatum, 8-ovulatum, 1·5 mm. longum, glabrum. *Legumen* 4–5-spermum, 7·5–8 cm. longum, 1 cm. latum, apiculo falcato terminatum, in basin gradatim angustatum, pilis patentibus obtectum, marginibus valde incrassatis.—*Calliandra grandiflora* Hemsl. Biol. i. 357, partim, non Benth.

Central America. Costa Rica : San José, *Oersted* 56 (type in Herb. Kew); by the river San Juan, *Oersted* 54.

1074. **Piriqueta (Erblichia) xylocarpa** *Sprague et Riley* [Turneraceae]; affinis *P. odoratae* (Seem.) Urb., a qua petiolis longioribus gracilibus, lamina pro rata angustiore in basin sensim attenuata apice acuta vel acuminata nec cuspidata, margine inconspicue tantum crenata, seminibus curvatis recedit.

*Rami* lignosi, teretes, glabri vel glabriusculi, fusco-cinerei, 7 mm. diametro circiter 3·5 dm. infra apices. *Folia* oblanceolata, 6·5–9·5 cm. longa, 2–3 cm. lata, apice acuta vel breviter acute acuminata, in basin sensim attenuata, tenuiter coriacea, concoloria, glabra, utrinsecus circiter 7–9-nervia, eglandulosa, inconspicue crenata; petioli graciles, 1–1·3 cm. longi, glabri, supra canaliculati; stipulae persistentes, late triangulares, vix 1 mm. longae, obtusae, superne subappresse fulvo-pilosae. *Flores* desunt. *Infructescentia* corymbosa; pedunculi sub fructu 1·6–2 cm. longi, glabriusculi; pedicelli solitarii, pedunculis crassiores, costati, basi vix ultra 2·5 mm. diametro, sursum gradatim incrassati, apice circiter 3·5 mm. diametro. *Capsula* ellipsoidea, lignosa, trivalvis, usque ad medium dehiscens, circiter 3·3 cm. longa, 1·5–1·7 cm. diametro, crebre subtiliter mammillata, juventute minute puberula, demum glabra; valvae obtusae marginibus obliquis circiter 2 mm. latis. *Semina* obovoidea, leviter curvata, apice rotundato-subtruncata, 4–4·5 mm. longa, 2 mm. diametro, pallide straminea, longitudinaliter flexuose costata, hilo conico 0·5 mm. longo.

Central America. British Honduras, *Campbell* 33.

1075. **Strobilanthes circarensis** *Gamble* [Acanthaceae-Ruellieae]; *S. neilgherrensi* Bedd. affinis, ramulis minus strigosis, bracteis obovatis nec oblongis, calycis lobis angustioribus, magis sericeo-villosis, et foliorum nervis supra impressis differt.

*Frutex* erectus, ramulis subtetragonis ultimis exceptis glabris. *Folia* ovata, acuminata, basi acuta, haud decurrentia, crenulata, supra pilis basi albide bulbosis ornata, subtus praecipue ad nervos strigosa, ad paginam superiorem lineolata, ad 12 cm. longa, 6 cm. lata, nervis primariis utrinque 5–6 curvatis, supra impressis, traversis subparellelis; petiolus 2 cm. longus, sed in foliis floralibus saepe 0. *Flores* in capitulis densissimis conferti ad apices ramulorum, foliis floralibus 4 cincti; bracteae obovatae, acutae, foliaceae, ad basim densissime villosae, 2 cm. longae;

bracteolae lineares, strigoso-hispidae, 15 mm. longae. *Calyx* fere ad basim 5-partitus, lobis sericeis linearibus bracteolis aequilongis supra glandulosis, infra subscariosis. *Corolla* ignota. *Ovarium* apice pubescens. *Capsula* oblongo-obovata, 1 cm. longa, glabra. *Semina* orbicularia, glabra.

S. India. Vizagapatam District in N. Circars, at Peddavalsa 700 m. alt., *Gamble* 21779, Jan. 1890; at Endrika and Vantala, 1500 m. alt., *A. W. Lushington*, May–June 1914.

1076. **Strobilanthes Lawsoni** *Gamble* [Acanthaceae-Ruellieae]; sectonis *Endopogon* species, *S. gossypino* T. Anders. affinis, lanitie appressa, spicis gracilibus interruptis et foliis longissime attenuatis differt.

*Frutex* erectus, circiter 2 m. altus, ramulis tetragonis, floriferis appresse fulvo-lanatis, fructiferis glanduloso-villosis. Folia ovata, longissime cuspidato-acuminata, basi acuta et paullo in petiolum decurrentia, supra glabra sed minute lineolata, subtus appresse fulvo- vel griseo-tomentosa, marginibus integris, nervis utrinque circiter 10 subparallelis, 12–16 cm. longa, 5–6 cm. lata; petiolus gracilis, 3–4 cm. longus. *Apicae* axillares vel laterales vel ramosum apices versus aggregatae, paniculatae, interruptae, floriferae appresse fulvo-tomentosae, fructiferae glanduloso-villosae, 6–10 cm. longae, flores ad nodos binos gerentes; bracteae ovatae acuminatae, intus glabrae, 5 mm. longae; bracteolae 2, lineares, minutae, calyce breviores. *Calyx* circiter 7 mm. longus ad mediam partem primum, deinde in sepalis 5 lanceolatis divisus, sepalis intus glabris, fructiferis eximie glandulosis. *Corolla* pallide caerulea, 2 cm. longa; tubus brevis cylindricus limbo longior ventricosus, extus villosus intus pilorum lineis 2 erectis barbatus; lobi erecti rotundati vix patentes. *Stamina* 2, inclusa, filamentis ad basim albo-villosis. *Ovarium* glabrum; stylus gracilis, glaber, ad apicum minutissime puberula. *Capsula* 1·5 cm. longa, clavate, seminibus 4, retinaculis duris. *Semina* discoidea, areolata, siccitate glabra, madida conspicue villosa.

S. India. Sispara Ghát, Nilgiris at about 1600 m. alt. in thick rain forest undergrowth, *M. A. Lawson and J. S. Gamble*, No. 13387, Nov. 1883 (flower); *J. S. Gamble*, No. 14252, June 1884 (fruit); Tambracheri Ghat, Wynaad, *C. A. Barber* 5686, Jan. 1903; among rocks, Hills of Travancore, *T. F. Bourdillon* 42. Cultivated in Sim's Park Gardens, Coonoor (*K. Rangachari*) also Agri. Hort. Gardens, Madras (*Bourne*).

1077. **Strobilanthes urceolaris** *Gamble* [Acanthaceae-Ruellieae]; *S. Wightiano* Nees affinis, corolla urceolata, staminibus per paria junctis, paribus longe separatis, interioribus minoribus, et foliis majoribus magis petiolatis differt.

*Frutex* erectus, ramulis inferioribus teretibus, ultimis plus minus tetragonis hirsutis, innovationibus rufo-hirsutis. *Folia* ovata, acuta, basi rotundata, crenata, siccitate nigra, rugosa, supra pilis basi bulbosis tecta et lineolata, subtus pilis albis munita, 6–8 cm. longa, 4 cm. lata, nervis primariis circiter 6–7

impressis, nervulis transversis etiam multis impressis; petiolus 2–3 cm. longus. *Flores* in capitulis densis brevibus sed fructiferis longioribus, foliis involucrantibus 2 vel pluribus ad basim munitis; bracteae obovatae apice crenatae; bracteolae lineares, 1 cm. longae, ciliatae. *Calyx* fere ad basim divisus; lobis linearibus, apice obtusis, albo-pilosis, 1 cm. longis, fructiferis majoribus et glandulosis. *Corolla* basi cylindrica vix 2 mm. longa, supra urceolaris 1 cm. longa intus pilorum fasciculo excepto glabra et flavo-brunnea, lobis rotundatis brevibus pallide roseis, ciliatis, subaequalibus. *Stamina* 4 didynama (quinto sterili interdum addito) monadelpha, paribus divaricatis longe separatis. *Ovarium* glabrum. *Capsula* obovata, acuminata, 1 cm. longa. *Semina* 4, complanata, glabra.

S. India. Pulney Hills, head of Bodenaikanur Ghát, *Beddome*; Nilgiri Hills, *Schmidt*, at about 2500 m. alt. May 1889; *Gamble* 20539, Ootacamund, Jan. 1920 (a small-leaved form); *Bourne* 6491.

1078. **Andrographis Lawsoni** *Gamble* [Acanthaceae-Justicieae]; species humilis, *A. lobelioidi* Wt. affinis, calycis lobis longioribus, antheris non albide-barbatis, foliis fere glabris differt.

*Suffrutex* humilis, basi lignosus, ramis multis ascendentibus, strigoso-hirsutis, alternis tetragonis. *Folia* ovata, obtusa vel obtuse acuta, basi rotundata, marginibus conspicue ciliatis reflexis exceptis glabra, 10–15 mm. longa, 7–10 mm. lata, nervis utrinque circiter tribus: petiolus minimus vix 2 mm. longus. *Flores* in racemis terminalibus foliosis, aliquando paniculatis, erectis, bracteae parvae lineares. *Calyx* fere ad basim 5-partitus, lobis linearibus, glanduloso-hispidis, ad 5 mm. longis. *Corolla* rosea, labii superioris lobis eximie purpureo-notatis; tubus vix ventricosus, extus glanduloso-hispidus 5 mm. longus. *Stamina* 2; filamenta superne glabra, inferae alata et hispida; antherae glabrae sine barba pilorum alborum. *Stylus* linearis. *Capsula* ignota.

S. India. S. Canara Ghâts, *Beddome*; Nilgiris, Ootacamund to Avalanche and Sispara, up to 2500 m. alt., *Wight* K. D. 2246, October 1852; *Gamble* 13349, November 1883; *Lawson*, November 1890.

1079. **Lepidagathis Barberi** *Gamble* [Acanthaceae-Justicieae]; *L. pungenti* Nees affinis, foliis angustioribus, bracteis et calycis lobis breviter mucronatis in capitulam ovoideam appressis nec patentibus differt.

*Fruticulus* humilis ramosus, ramulis subangulatis albis, ultimis albo-villosis. *Folia* coriacea, sessilia, ovato-oblonga, spinoso-mucronata, margine ciliata, 10–15 mm. longa, 4 mm. lata, nervis utrinque 3–4 in spinam desinentibus. *Flores* in capitulis axillaribus multibracteatis congesti; capitulae ovoideae, circiter 1 cm. longae; bracteae et bracteolae lanceolatae spinoso-mucronatae albido-pilosae. *Calyx* 5-partitus, lobi exteriores 3, quorum 2 ad mediam partem juncti, tertius latior, interiores 2 angusti magis pilosi, omnes breviter mucronati. *Corollae* tubus

2 mm. longus, limbus subito expansus bilabiatus extus villosus. *Stamina* 4 didynama. *Capsula* 2-locularis conica, apice solida, seminibus 2.—*L. pungens*, Wight Ic. t. 456 *non* Nees.

S. India. Mysore and Carnatic, *G. Thomson* 105; Koilpatti, Tinnevelly, *C. A. Barber* 3427, July 18, 1901; plains of Madura District, *Beddome*.

1080. **Chrysalidocarpus glaucescens** *Waby* [Palmae-Areceae]; species ex affinitate *C. lutescentis* H. Wendl. a qua tota planta fructu excepto glaucescente, caudice basi incrassato fructuque viridi-lutescente differt.

Tota planta glaucescens. *Caudices* 1·5–1·8 dm. diametro, basi conicus usque ad 3 dm. diametro, annulis distantibus instructi. *Folia* semierecta, apice recurvata, 2·43–3·48 m. longa; costa subtus convexa, supra canaliculata; pinnae alternae, bifariae, semierectae, 6–9 dm. longae, 5 cm. latae, acuminatae, inter se 3·75 cm. distantes, apice fissae, basi constrictae, nervis marginalibus instructae. *Spadices* interfoliacea, robusta, reclinata; rami expansi, 9 dm. longi; ramuli 1·75–2·25 dm. longi. *Flores masculi* albi, minuti, dense aggregati. *Sepala* rotundata, profunde concava, 1·5 mm. diam., valde imbricata, carinata, marginibus membranaceis. *Petala* ovalia, obtusa, striata, 3 mm. longa, 1·5 mm. lata. *Filamenta* subulata, quam petala longiora; antherae 2 mm. longae, obpyriformes. *Ovarii* rudimentum columnare, quam petala paullo brevius. *Flores feminei* non visi. *Fructus* ellipticus, viridi-lutescens, 1·56 cm. longa, 6·25 mm. diametro.

West Indies. Trinidad; Port of Spain, Victoria Square (cult.), *Trinidad Botanic Garden Herbarium*, no. 9849, coll. *J. F. Waby*.

Mr. Waby notes that there are four plants of this species growing within a short distance of each other and that they can easily be distinguished from those of *C. lutescens* growing close by on account of their being glaucescent and having the rings on the stem more pronounced and wider apart. The largest plant has two stout stems with swollen bases forked just above the ground just like the forking of the Doum Palm (*Hyphaene*) and three stout stems with swollen confluent bases crowded together but not forked, as well as several other smaller stems. Neither of the other plants has a forked stem. The history of these plants has not been recorded.

# XLI.—REVISION OF THE GENUS DICOMA.

F. C. Wilson.

The generic name *Dicoma* was first mentioned by Cassini in 1817[1] in his account of the tribe *Carlineae*, and the type species, *D. tomentosa*, was described by him in 1818[2]. He published a further description of the genus and species in 1819[3].

Lessing, in his account of the *Compositae* of the Berlin Herbarium in 1830[4], added five new species, and arranged them in three sections, founded on characters derived mainly from the pappus, as follows :—

Sect. I. *D. tomentosa, D. capensis.*
Sect. II. *D. radiata.*
Sect. III. *D. relhanioides, D. diacanthoides, D. Burmannii.*

Two years later Lessing[5] raised these sections to subgeneric rank as follows :—I. *Leucophyton.* II. *Rhigiothamnus.* III. *Macledium.*

De Candolle[6] in 1838 enumerated ten species, slightly rearranging the groups and splitting Lessing's *Leucophyton* into two parts, *Eudicoma* and *Steirocoma*, and he added a fifth, *Pterocoma*, which included *D. speciosa.*

In 1864–5 Harvey[7] gave descriptions of eleven species from South Africa, arranged more or less after De Candolle, whilst in 1877 Oliver and Hiern[8] recorded four species from Tropical Africa.

In the following revision I have found it convenient to divide the 34 species now known into three sections :—

I. *Dimorphae.*—Pappus dimorphous, the outer setae barbellate or very rarely those of the outer flowers uniform and plumose (*D. capensis*), the inner setae broader with more or less membranous margins.

II. *Barbellatae.*—Pappus not dimorphous, all the setae barbellate.

III. *Plumosae.*—Pappus not dimorphous, all the setae plumose.

The following Revision is compiled from an examination of the material in the herbaria of the Royal Botanic Gardens, Kew, and the Natural History Museum, South Kensington. I am also indebted to Archdeacon Rogers for placing the specimens from his herbarium at my disposal.

## Key to the Species.

Section I. Dimorphae.

Pappus of all the flowers barbellate :

Leaves glabrescent or scabrid above, with

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[1] Dict. Sci. Nat., 7 : 110; [2] Bull. Soc. Philom. 12; [3] Dict. Sci. Nat. 13 : 194; [4] Linnaea 5 : 276; [5] Synop. Composit. 109; [6] Prodromus 7 : 35; [7] Fl. Cap. 3 : 516; [8] Fl. Trop. Afr. 3 : 442.

a loose indumentum below; heads 4–5 cm. in diameter, thistle-like with very numerous (over 200) stiff narrow spine-like bracts; Angola - - - - - 1. *Welwitschii.*

Leaves hairy on both surfaces, densely woolly or felted below; heads smaller and with much fewer bracts than the preceding:

Inner pappus much broader than the outer, especially toward the base:

Involucral bracts tomentose, with long, slender, spreading, spine-like tips longer than the pappus; leaves linear to spathulate; Trop. Africa to India - - - - - - 2. *tomentosa.*

Involucral bracts glabrous with pointed tips; much wider in upper part than preceding, and longer than the pappus; leaves linear or linear-lanceolate; heads rather large (about 2 cm. in diameter); Angola - - 3. *Antunesii.*

Involucral bracts shortly pointed and concave, not longer than the pappus; leaves spathulate; heads small; Tanganyika - - - - - - 4. *bangueolensis.*

Inner pappus not broader than the outer in the upper part, but broadly ovate in the lower third; inflorescence cymose, many-flowered; tips of outermost bracts generally somewhat reflexed, and lower two-thirds of bracts strongly marked by two purple-black lines on the outer surface; Angola - - - 5. *foliosa.*

Pappus of marginal flowers uniform and plumose; outer pappus of inner flowers dimorphic, barbellate in the lower part, shortly plumose in the upper part, inner pappus expanded towards the base, plumose above the middle; South Africa - - - 6. *capensis.*

Section II. BARBELLATAE.

Involucral bracts with fine thread-like tips widening gradually toward the base:

Leaves linear to linear-lanceolate:

Heads few, large, up to 4 cm. in diameter, and usually wider than long:

Involucral bracts lanate or glabrous, numerous (at least 100) and very stiff; Trop. and South Africa - - 7. *anomala.*

Involucral bracts glabrous, few and yielding; Angola - - - - 8. *elegans.*

Involucral bracts very hairy; Belgian Congo - - - - - - 9. *Ringoeti.*

Heads numerous, not more than 2 cm. in diameter and usually longer than wide. Involucral bracts few (about 50) and glabrous; Trop. and South Africa 10. *Gerrardi.*

Heads globose; leaves and flowers soon falling; peduncles persistent, giving a spiny appearance to the plant; Somaliland - - - - - - - 11. *somalensis.*

Leaves ovate, spathulate, or suborbicular:

Outer involucral bracts recurved and yielding; leaves ovate or suborbicular:

Leaves sessile, ovate, woolly-lanate below, at length almost glabrous above; heads sessile in leaf axils and longer than broad; South Africa - 12. *macrocephala.*

Leaves shortly petiolate, suborbicular, woolly-lanate on both surfaces; heads sessile in leaf axils, not longer than broad; Trop. and South Africa - - - - - 13. *Schinzii.*

Leaves sessile, obovate, lanate on lower surface, glandular-punctate above; heads pedunculate; South Africa - - - - - - 14. *Galpinii.*

Outer involucral bracts not recurved, and resistant; leaves small and spathulate:

Involucral bracts glabrous; leaves glandular above; South Africa - 15. *picta.*

Involucral bracts woolly; leaves tomentose on both surfaces; Angola 16. *Nachtigalii.*

Involucral bracts broadly ovate at the base; margins of the upper part inrolled, forming short, stiff, spreading spines:

Leaves ovate to suborbicular, shortly petiolate, conspicuously 1-nerved, tomentose below, at length almost glabrous on upper surface; South Africa - - - 17. *spinosa.*

Leaves ovate, glabrous, rather fleshy and veinless; South Africa - - - - - 18. *ramosissima.*

Leaves lanceolate, broad-based, sessile, tomentose on upper surface, glabrous below; South Africa - - - - - 19. *relhanioides.*

Leaves linear, narrower at base, canous below; S.W. Africa - - - - - 20. *Dinteri.*

Leaves inrolled, woolly-lanate, sessile; Socotra - - - - - - - - 21. *cana.*

Involucral bracts ovate and concave, with short pungent points, margins not inrolled :
Leaves ovate-elliptic, shortly petiolate, lower surface tomentose; heads longer than broad; Madagascar - - - 22. *incana*.
Leaves linear-lanceolate, almost sessile; heads about as long as broad; Madagascar 23. *Cowani*.

Section III. PLUMOSAE.

Leaves dimorphic; the lower few and ob-ovate, petiolate; the upper very numerous and densely imbricate, lanceolate with pungent points, resembling and gradually merging into the involucral bracts; heads large, solitary, terminal; South Africa - 24. *argyrophylla*.
Leaves not dimorphic; more or less sharply differentiated from the involucral bracts :
Leaves long attenuated to the base, and usually much broader in the upper part, mostly oblanceolate or obovate :
Plants 1 ft. or more in height :
Heads usually few; leaves linear to obovate-oblanceolate, with numerous spreading lateral nerves; Trop. Africa - - - - - - 25. *sessiliflora*.
Heads solitary or up to three; leaves obovate with few ascending lateral nerves; South Africa - - - 26. *Zeyheri*.
Heads numerous in a panicle; leaves oblanceolate; South Africa - - 27. *thyrsiflora*.
Plants about two inches in height; Trop. Africa - - - - - 28. *nana*.
Leaves quite sessile with broad, clasping bases, sometimes decurrent, mostly linear or linear-oblong :
Outermost involucral bracts reflexed; heads pedunculate; leaf-bases clasping :
Leaves acute, canous below, margins revolute; peduncles not bracteate; involucral bracts somewhat flat, often with markedly membranous margins; Trop. Africa - - - - - 29. *Kirkii*.
Leaves linear to sub-spathulate, canous below; margins minutely serrate; Somaliland - - - 30. *gnaphaloides*.
Leaves obtuse, thinly hairy below; peduncles bracteate; flower heads in a dense panicle; Belgian Congo - 31. *Poggei*.
Leaves acute, becoming glabrous on both surfaces, margins not revolute; peduncles bracteate; involucral bracts concave; Natal - - - 32. *speciosa*.

Outermost involucral bracts not reflexed; leaf bases forming a sheath around the stem; S. Trop. Africa:

Flower heads sessile or subsessile in the axils of the uppermost leaves; upper leaves linear-lanceolate; plants up to 30 cm. high - - - - - 33. *quinquenervia*.

Flower heads terminating short lateral branches; upper leaves narrowly linear; plants about 1 m. high 34. *vaginata*.

1. **D. Welwitschii** *O. Hoffm.* in Engl. Bot. Jahrb. 15: 544 (1893); Hiern in Cat. Afr. Pl. Welw. 1: 613 (1898).

Tropical Africa. Angola: Pungo Andongo; in sandy open woods near Mopopo and Sansamanda, May 1857, *Welwitsch* 3609 (type)! Malange, *Gossweiler* 1211! Kaconda, *Gossweiler* 1798! Cubango River, *Gossweiler* 1867! 3863!

2. **D. tomentosa** *Cass* in Bull. Soc. Philom. 1818: 47; Less. Synop. Composit. 108 (1832); DC. Prodr. 7: 36 (1838); Oliv. & Hiern in Oliv. Fl. Trop. Afr. 3: 443 (1877); Hook. f. Fl. Brit. Ind. 3: 387 (1881) incl. synonyms; O. Hoffm. in Engl. Bot. Jahrb. 15: 543 (1883); Hiern in Cat. Afr. Pl. Welw. 1: 613 (1898).

Tropical Africa. Senegambia: Lamsaar, *Leprieur*! French Sudan: Sicoro, *Chevalier* 221a; Ivory Coast, *Poisson*! N. Nigeria, *Moiser* 179! 264! Borgu; rocks near the town of Wawa, *Barter* 1299! Kouka, in sandy places, Jan. 1854, *E. Vogel* 30! Katagum Dist.; in fields, *Dalziel* 171! Sokoto, *Lely* 111! Kafaretti, Oct., *Lely* 676! W. Cameroons, *Talbot*! Angola: In sandy mint beds about Maianga do Pova, Feb. 1858, *Welwitsch* 3622! On a sandy clay soil, in places flooded in the rainy season, about the Lagõas de Funda, Icolo E. Bengo and Zenza do Golungo, *Welwitsch* 3623! in rough sunny situations near Bumbo, June 1860, *Welwitsch* 3990! dry river beds near Mossamedes, *Gossweiler* 64! Loanda, *Gossweiler* 166! *Rattray*! Olnkonda, 1886, *Schinz* 2009! Eastern Sudan: Kordofan, *Kotschy* 99! *Pfund* 271! Djika, *Pfund* 366! Arasch-Cool, *Schimper* 100! Sheikh Talha, *Broun* 816! Abyssinia: in the mountains near Dscheladscheranne, *Schimper* 724! without precise locality, *Schimper* 426! near Gageros, *Schimper* 2262! Bogos, *Hildebrandt* 423! Colonia Eritrea: Bocos, *Pappi* 4! Kenya Colony: Saui, *Kassner* 758! Ngamiland: Kwebe Hills, *Lugard* 216! Rhodesia: Boruma, Dec., *Menyhart* 518! Bulawayo and Victoria Falls, *Eyles* 136! Port. E. Africa: Kaimba Island, *Kirk*!

Native Name: Dowda (Dalziel).

South Africa. Transvaal: Komati Poort, *Schlechter* 11844! *Rogers* 19532! 19537! Messina Div.; Zoutpansberg, *Rogers* 20993! Pietersburg Div.; The Downs, *Rogers* 20227!

Socotra. *Schweinfurth* 438! *Balfour* 228!

India. Gangetic Plain: ravines near Etawah, *Duthie* 4718! N.W. India, *Royle*! Dhaulpoor, *Jameson*! Punjab: Hissar dist.; Tusham, *Drummond* 25556! 25557! near Rewari, *Drummond* 15179! near Dadam, *Drummond* 15178! near Mount Dahlu, Narnuaul, *Drummond* 15177! Scind, *Stocks*! Bombay, *Herb. Lambert*! *Dalzell*! Gokak Falls, *Ritchie* 1803! Madras, *Shooter*! *Herb. Wight* 1670! 1497! Nilghiri Hills, *Hook. f. & Thompson*: Mysore: Barbadun Hills, *Law*! Coimbatore Dist.; Bhavani, *Bourne* 5067! *Champion*! *Herb. Wight* 1670! Courtallum, *Hook. f. & Thomson*!

3. **D. Antunesii** *O. Hoffm.* in Warb. Kunene-Sambesi Exped. 425 (1903).

Tropical Africa. Angola: Mundongo, *Baum* 926! near Mumpulla, very rare, *Welwitsch* 3608!

4. **D. bangueolensis** *Bus. et Musch.* in Engl. Bot. Jahrb. 49: 514 (1913).

Tropical Africa. Tanganyika Territory: Mountain Plains between Usumbura and Bukoba, 1100 m., June 1910, *Helena von Aosta* 1211.

5. **D. foliosa** *O. Hoffm.* in Engl. Bot. Jahrb. 15: 543 (1893) and in Bol. Soc. Brot. 10: 184 (1893).

Tropical Africa. Angola: Mossamedes; Garganta do Rio Bero, *Welwitsch* 3617! at base of Montes Negros, *Welwitsch* 3618! annual, or gradually turning woody and biennial with gnaphaloid habit, *Welwitsch* 3619!

6. **D. capensis** *Less.* in Linnaea 5: 277 (1830); Less. Synop. Composit. 109 (1832); DC. Prodr. 7: 36 (1838); Harv. in Fl. Cap. 3: 516 (1865).—*D. capensis* vars. *leiolepis* and *angustifolia* DC. Prodr. 7: 36 (1838).

South Africa. S.W. Protectorate: near Ruman's Drift *Pearson* 4516! 4698! branches prostrate in sand, *Pearson*, 4045! in sand, Reitfontein, *Pearson* 3460! sandy slopes at Kamabies, *Pearson* 3779! on sandstone at Sandverhaat, *Pearson* 4684! High plateau north of Freistadt, *Pearson* 9393! Great Fish River Bed, *Pearson* 9277! Haikamchal, *Pearson* 7665! western Karasberg; stony slopes on granite plateau between Dassiefontein and Noachebel, *Pearson* 7916! Karroo: in desert, *Drège*! Prince Albert Div.; near Welteorede, *Drège* 1839! by the Sunday River, *Burchell* 2940! stony hill sides, Graaff Reinet, *Bolus* 447! Middelburg Div., *Gilfallan* 2992! Bushman Land: on red sand near outspan, 8 miles S.W. or W. of Bitterfontein, *Pearson* 3312! Bechuanaland: Springbokhom, *Zeyher* 1030! Prieska Div.; Modder Gat Poort, *Burchell* 1620! Herbert Div.; Douglas, *Orpen* 1911! Orange Free State: on rocky hills where the soil is red, *Barker* 29! Kimberley; grass veldt, *Wilman*! Transvaal: Brack River, *Burke*! Aapges River, *Burke*!

7. **D. anomala** *Sond.* in Linnaea 23: 71 (1850); Harv. in Fl. Cap. 3: 517 (1865); Oliv. and Hiern in Fl. Trop. Afr. 3:

443 (1877); Hiern in Cat. Afr. Pl. Welw. 1 : 613 (1898).— *D. anomala* var. *Sonderi* Harv. and var. *cirsioides* Harv. in Fl. Cap. 3 : 517 (1865); D. *cirsioides* Harv. l.c. nomen. *D. karaguensis* Oliv. in Trans. Linn. Soc. 29 : 103 (1873). *D. anomala* var. *karaguensis* Oliv. and Hiern in Fl. Trop. Afr. 3 : 443 (1877). O. Hoffm. in Bol. Soc. Brot. 10 : 185 (1893); Hiern in Cat. Afr. Pl. Welw. 3 : 614 (1898). *D. nyikensis* Baker and *D. megacephala* Baker in Kew Bull. 1897 (271).

Tropical Africa. Angola : on rocky slopes of Alto Queta among short grass, *Welwitsch* 3614 ! on dry elevated declivities of the Central Queta, Carangue, *Welwitsch* 3613 ! in open gravelly pastures near Mumpulla, *Welwitsch* 3610 ! on the northern sunny slopes of the mountains of Alto Queta, *Welwitsch* 3607 ! in sandy thickets near the Monino, *Welwitsch* 3611 ! Malange, *Gossweiler* 1153 ! Massaca Kuelai, *Gossweiler* 3341 ! Kassuango, *Gossweiler* 3742 ! Tonga-Kuiriri, *Gossweiler* 4096 ! 4076 ! Munongue, *Gossweiler* 4143 ! Kuiriri, *Gossweiler* 4142 ! Micango, *Gossweiler* 3712 ! Kubango, *Gossweiler* 4179 ! Kuito, *Gossweiler* 3785 ! Benguella, *Wellmann* ! Huilla; Humpata, *Johnston* ! Kenya; Karagué, *Speke and Grant* ! *Stuhlmann* 1672 ! Belgian Congo : near Mt. Masisi, *McClounie* 30 ! Mt. Lengo, *Kassner* 2979 ! Lapiku River, *Kassner* 2860 ! Kundelongu, *Kassner* 2798 ! Tanganyika region : Niamkolo, *Carson* ! Kwebe *Baum* 804 ! 862 ! Ruwenzori; on dry hills, *Scott Elliot* 8144 ! Nyasaland, *Buchanan* 692 ! Nyika Plateau, *Whyte* 51 ! Shire Highlands, *Buchanan* 83 ! between Kondowe and Karonga, *Whyte* 512 ! Rhodesia : Livingstone; N. bank of Zambesi, *Rogers* 7497 ! in sandy soil, Livingstone, *Rogers* 7151 ! Mumbwa, *Macaulay* 347 ! 347B ! Selukwe, *Walters* 2346 ! Bulawayo, *Rand* 486 !

South Africa. Northern Kalahari Desert, near Inkonane Pito, *Lugard* 294 ! Transvaal : Waterburg Div.; Leeuwpoort, *Rogers* 21202 ! Lydenburg, *Rogers* 14568 ! Pilgrim's Rest, *Rogers* 14163 ! *Wilms* 657 ! Rustenburg, *Rogers* 22289 ! Pretoria, *Leendertz* 1096 ! Meintjes Kop, *Burtt Davy* 3389 ! 5389 ! Irene, *Rogers* 23825 ! Rayton, *Rogers* 20467 ! Waterval Boven, *Mason* 121 ! Standerton, *Rogers* 18761 ! Boshoff, *Burtt Davy* 14457 ! Johannesburg, *Rand* 1256 ! Potchefstroom; Welverdiend Stn., on sour veldt, *Burtt Davy H.*14562 ! Lichtenburg, apparently local on stony red soil, *Burtt Davy* 6 ! Wolmaransstad, *Rogers* 20619 ! Barberton; Kaapsche Hoep, *Rogers* 21269 ! Swaziland : Mbabane, *Rogers* 11469 ! Natal : Ingoma, *Gerrard* 1003 ! on the side of stony hills above the road leading up Oliver's Hoek Pass, *Wood* 3594 ! Greytown, *Wood* 881 ! Drakensberg, *Wood* 686 ! *Trannin* 2009 ! Mohlamba Range, *Sutherland* ! East Griqualand : Kokstad, *Tyson* 1490 ! Basutoland : Leribe, *Dieterlen* 7149 ! 58 ! Doorn Key, *Burke* ! Cala, *Pegler* 1715 ! Orange Free State : Bloemfontein, *Rehmann* 3826 ! Harrismith, *Sankey* 146 ! Vredefort, *Barrett-Hamilton* ! on rocky hills,

*Baker* ! Cape : Albert Dist., *Cooper* 1369 ! Maclear Div., banks of Klein Pot River, *Galpin* 6754 !

8. **D. elegans** *Welwitsch* ex O. Hoffm. in Engl. Bot. Jahrb. 15 : 544 (1893).

Tropical Africa. Angola : open forests at Nene, *Welwitsch* 3621 ! Huilla, *Welwitsch* 3620 ! Chella mountains, *H. H. Johnston* ! Mount Amaral, *Gossweiler* 1822 !

9. **D. Ringoeti** *De Wild.* in Fedde Repert. 13 : 210 (1914).

Tropical Africa. Belgian Congo : Katanga ; Shinsenda, *Homblé* 494.

10. **D. Gerrardi** *Harv.* in Fl. Cap. 3 : 517 nomen.—*D. anomala* var. *microcephala* Harv. in Fl. Cap. 3 : 517 (1865) ; Oliver and Hiern in Fl. Trop. Africa 3 : 443 (1877).

Tropical Africa. Salisbury, *Craster* 4 ! *Rand* 1445 ! *Hislop* 50 ! near Rhodes Dam, *Eyles* 1176 ! Victoria, *Munro* 883 ! Bulawayo, *Rogers* 13664 !

South Africa. Cape : without locality, *Burke* ! Prieska Division ; Moddersfontein, *Conrath* 534 ! Transvaal : Zoutpansberg, *Burtt Davy* 2857 ! Pietersburg, *Bolus* 11029 ! Makapansberge ; Streydpoort, *Rehmann* 5444 ! Lydenburg, *Wilms* 658 ! *Rogers* 14566 ! South African Goldfields, *Baines* ! Mountain sides, Saddleback Range, Barberton, *Galpin* 835 ! Rustenburg, *Nation* 158 ! Boshveld ; between Elandsriver and Klippan, *Rehmann* 5075 ! Johannesburg, *Rand* 1260 ! Houtbosh, *Rehmann* 6142 ! Heidelburg, *Rogers* 13664 ! Orange Free State : Bloemfontein, *Rehmann* 3777 ! Zululand, *Gerrard* 1058 ! Natal : in dry places, *Sutherland* ! Port Natal, *Gerrard and M'Ken* 1058 ! Ladysmith, *Wood* 5639 !

11. **D. somalensis** *S. Moore* in Journ Bot. 1899 : 60.

Tropical Africa. Somaliland : Golis Range, *Drake-Brockman* 164 ! Bastireh, *Drake-Brockman* ! near Obbia, *Drake-Brockman* 960 ! Wagga Mountains ; Upper Sheik, *Lort Phillips* ! *E. M. Godman* 75 !

12. **D. macrocephala** *DC.* Prodr. 7 : 36 (1838) ; Harv. in Fl. Cap. 3 : 516 (1865).

South Africa. Klipplaat River, *Drège* ! Bechuanaland : near the pass in the Krooman Hills, *Burchell* 2179 ! Pellar Plains, *Burchell* 2238 ! Vryburg, *Burtt Davy* 13785 ! Orange Free State : Bloemfontein, *Odendaal* ! Transvaal : Pietersburg, *Rogers* 897 ! Komati Poort, *Rogers* 20388 ! *Schlechter* 11786 ! Aapies Poort, Pretoria, *Rehmann* 4056 ! Magalisburg, *Zeyher* 1029 ! Wolmaransstad, *Rogers* 20618 !

13. **D. Schinzii** *Hoffm.* in Engl. Bot. Jahrb. 15 : 543 (1893).

Tropical Africa. Rhodesia : Victoria Falls, *Rogers* 5300 ! Sesheke District, *Gairdner* 218 ! Selukwe, *Walters* 2345 ! *Walters* 2347 !

South Africa. Hereroland: Windhoek, *Dinter* 264! Bechuanaland: Northern Kalahari Desert; Chukutsa Salt Pan, *Lugard* 222! Kwebe Hills, *Lugard* 163! Griqualand West: Hay Division; Klip Fontein, *Burchell* 2168! Orange Free State: rocky hills, *M. E. Barter*! *Nelson* 31! Transvaal: Waterberg; Nylstroom, *Rogers* 24992!

14. **Dicoma Galpinii** *F. C. Wilson* sp. nov.; affinis *D. Schinzii* O. Hoffm., sed foliis sessilibus vel subsessilis, obovato-oblanceolatis supra crebre glanduloso-punctatis, capitulis pedunculatis differt.

*Herba* perennis usque ad 30 cm. alta; caules erecti, graciles, angulati, superne leviter ramosi, laxe foliati, indumento lanato albido obtecti. *Folia* sessilia vel subsessilia, obovata vel oblanceolata, basi angustata, apice acuta, usque ad 5 cm. longa et 1·7 cm. lata, coriacea, minute serrulata, supra crebre glanduloso-punctata, epilosa, infra dense albido-lanata. *Capitula* solitaria, terminalia, pedunculata. Involucrum campanulatum, circiter 1·2 cm. longum; bracteae pluriseriatae, lineari-lanceolatae, superne subfiliformes et recurvatae, pallide stramineae, glabrae. *Pappi setae* homomorphae, albae, 5 mm. longae, barbellatae. *Achaenia* angularia, ex parte inferiore pilis cinereo-albidis ascendentibus ornata.

South Africa. Transvaal: Pyramid Estate, near Potgietersrust Ravine, in granite mountains, 24th June, 1921, *Galpin* 9017 (type)!

15. **D. picta** *Druce* in Rep. Bot. Exch. Club Brit. Isl. 1916, 619.—*Leyssera picta* Thunb. Prodr. Pl. Cap. 160 (1800); Thunb. Fl. Cap. ed. Schultes 692 (1823). *Dicoma radiata* Less. in Linnaea 5: 278 (1830); Less. Synop. Composit. 369 (1832). Harv. in Fl. Cap. 516 (1864–5).

South Africa. Cape: *Thunberg* (type), *Mundt and Maire*; Uitenhage, *Echlon and Zeyher*! *Alexander Prior*! Karroo: Prince Albert Div., *Bolus* 11583! beyond Hartequas Kloof, *Massen*!

16. **D. Nachtigalii** *O. Hoffm.* in Engl. Bot. Jahrb. 15: 545 (1893).

Tropical Africa. Angola: Mossamedes; Tiger Bay, *Nachtigal* (type).

South Africa. S.W. African Protectorate: Angra Pequena, *Galpin and Pearson* 7642!

17. **D. spinosa** *Druce* in Rep. Bot. Exch. Club Brit. Isl. 1914, 417.—*Xeranthemum spinosum* Linn. Sp. Pl. 2: 1203 (1753); Thunb. Prodr. Pl. Cap. 153 (1800); Thunb. Fl. Cap. ed. Schult. 664 (1823). *D. Burmannii* and *D. diacanthoides* Less. in Linnaea 5: 279 (1830); DC. Prodr. 7: 37 (1838); Harv. in Fl. Cap. 3: 517 (1865). *D. latifolia* DC. Prodr. 7: 37 (1838).

South Africa. Cape: *Thoms* 376! Paarl Div.; gravelly slopes near Paarl, *Tyson* 870! Worcester Div.; Dutoits Kloof, *Drège*! Caledon Div.; Zwartberg, *Schlechter* 9794! Bredesdorp

Div.; *Schlechter* 9641 ! Swellendam; on dry hills near Brede River, *Burchell* 7467 ! near Buffeljagte River Drift, *Burchell* 7267 ! between Swellendam and Brede River, *Burchell* 7447 ! Riversdale; Zoetemeeks River, *Burchell* 6798 ! 6682 ! between Garcia's Pass and Krombeks River, *Burchell* 7166 ! George Div.; Keurbooms River, *Drège* 1039 ! Uniondale; Long Kloof, on a rocky hill near Haarlem, *Burchell* 5012 ! Uitenhage, *Zeyher* ! hills at Gert's Kraal, *Alex. Prior* ! Somerset, *Bowker* ! between Commadagga and Zwartwater Poort, July 7, 1813, *Burchell* 335A ! Graaff Reinet, *Bolus* 8564 ! without locality, *Masson* ! *Niven* !

18. **D. ramosissima** *Klatt* in Bull. Herb. Boiss. 4 : 843 (1896).

South Africa. Gt. Namaqualand : Keetmanshoop, *Fleck* 116; *Fenchel* 51.

I have not seen a specimen of this plant, but from description it comes very near *D. spinosa* Druce.

19. **D. relhanioides** *Less.* in Linnaea 5 : 279 (1830); Less. Syn. Composit. 110 (1832); DC. Prodr. 7 : 37 (1838).

South Africa. Karroo : Gamkas, *Mundt and Maire* (type).

20. **D. Dinteri** *S. Moore* in Bull. Herb. Boiss. Ser. ii. 4 : 1024 (1904).

South Africa. Hereroland; Windhoek, 1904, *Dinter* 1025 (type).

21. **D. cana** *Balf. f.* Bot. Socotra, 143 (1888).

Socotra : *Mr. & Mrs. Theodore Bent* ! *Balfour* 157 (type) !

22. **D. incana** *O. Hoffm* in Engl. et Prantl, Naturl. Pflanzenfam. 4 : 5 : 339 (1893).—*Brachychaenium incanum* Baker in Journ. Linn. Soc. 25 : 330 (1890).

Madagascar. A tree; sterile places near Trabonji, *Hildebrandt* 3446 (type) ! *Baron* 6797 !

23. **D. Cowani** *S. Moore* in Journ. Bot. 44 : 149 (1906).

Madagascar. Ankafana, *Deans Cowan* (type) !

24. **D. argyrophylla** *Oliv.* in Hook. Icon. Pl. t. 15 : 1461 (1884).

South Africa. Natal : *Gerrard* 1906 (type) ! Farkkop, *Rehmann* 7656 ! grassy hills between Umlaas and Camperdown, *Wood* 359 ! 1825 ! Zululand : Farm Egoa, *Curson* 1643 ! Alexandra Dist; Dumisa, *Rudatis* 1344 ! East Griqualand : Clydesdale, *Tyson* 1192 !

25. **D. sessiliflora** *Harv.* in Fl. Cap. 3 : 518 (1865); Oliv. & Hiern in Fl. Trop. Africa 3 : 444 (1877).—*D. membranacea* S. Moore in Bull. Herb. Boiss. Ser. ii. 4 : 1025 (1904).

Tropical Africa. N. Nigeria : in cultivated ground at Abinsi, *Dalziel* 663 ! Lokoja; in spur of Mount Patti, *Dalziel* 33 ! by the roadside, *Parsons* 75 ! Borgu, *Barter* 717 ! Naraguta; on bare ground, *Lely* 701 ! Angola : Bailundo Dist; Benguella,

*Wellman* ! Monongue, *Gossweiler* 4145 ! 2637 ! 3340 ! Sudan : Abu Gurun ; Seriba, *Schweinfurth* 4282 ! Belgian Congo : Elisabethville, *Burtt Davy* 18051 ! Musofi River, *Kassner* 2689 ! Mt. Mugila, *Kassner* 2991 ! Tanganyika Territory : Manganja Hills, *Meller* (type) ! Nyasaland : Panda Peak, *McClounie* 19 ! Shiri Highlands, *Buchanan* 457 ! 149B ! 989 ! 738 ! Zomba, *Sharpe* 162 ! near Lake Nyassa, *Johnston* ! Lukoma, *Bellingham* ! Port. E. Africa : Rovuma, *Kirk* ! Ntondwe, *Cameron* 120 ! Rhodesia : Umtali, *Rogers* 4058 ! Broken Hill, *Rogers* 8115 ! Mumbwa, *Macaulay* 747 !

Native Name : Alkamman kwadi (Dalziel).

26. **D. Zeyheri** *Sond.* in Linnaea, 23 : 71 (1830) ; Harv. in Fl. Cap. 3 : 518 (1865).

South Africa : Transvaal : Rustenburg, *Rogers* 1 ! in dry sandy soil, *Nation* 179 ! Magalisburg, *Burke & Zeyher* 1031 (type) ! *Burke* ! Pretoria ; Gezina, *Mogg* 1002 ! *Burtt Davy* 5377 ! Meintjes Kop, *Burtt Davy* 3961 ! 5377 ! Arcadia, *Burtt Davy* 3925 ! *Rehmann* 4785 ! Johannesburg ; Turffontein, *Bryant* D90 ! *Rogers* 1358 ! *Rand* 1258 ! Burttholm, Vereeniging, *Burtt Davy* 15258 ! Lydenburg, *Wilms* 661 ! 661a ! Dwar River, *Nelson* 548 ! Barberton ; Nelspruit, *Rogers* 20252 ! *Ragton*, *Rogers* 20450 ! Waterval Boven, *Rogers* 14098 ! *Mason* 8 ! Komati River, *Jenkins* 1303 ! Swaziland : *Stewart* 6 ! Mbabane, *Rogers* 11662 ! Zululand : *Wood* 739 ! Natal : *Gerrard* 1028 ! on grassy slopes, Hlaticula, *Stewart* 86 ! *Stainbank* 3644 !

27. **D. thyrsiflora** *Thell.* in Thell. & Schinz, Viert. Naturf. Gesell. Zur. 66 : 251 (1921).—*D. Zeyheri* Sond. var. *thyrsiflora* Klatt. in Bull. Herb. Boiss. 4 : 844 (1896).

South Africa. Transvaal : Kaap river valley ; Barberton, *Galpin* 911 (type) !

28. **D. nana** *Welw.* Hiern in Cat. Afr. Pl. Welw. 3 : 614 (1898).—*D. plantaginifolia* O. Hoffm. in Engl. Bot. Jahrb. 15 : 546 (1893).

Tropical Africa. Angola : Lopollo and Mumpulla, *Welwitsch* 3615 (type) ! 3616 ! Thickets at N'Bango, Malange, *Gossweiler* 1207 ! Kubango, *Gossweiler* 4350 !

Hoffmann's specimen of *D. plantaginifolia* described from a very imperfect example from Malange, Angola (*Teuscz* 180) is identical with *D. nana* Welw.

29. **D. Kirkii** *Harv.* in Fl. Cap. 3 : 518 (1865) ; Oliv. & Hiern in Fl. Trop. Afr. 3 : 444 (1877).—*D. Kirkii* var. *microcephala* S. Moore in Journ. Bot. 1921 : 231.

Tropical Africa. Tanganyika Plateau : Fort Hill, *Whyte* ! Nyasaland : Shire Highlands, *Adamson* 79 ! Kondowe, *Whyte* ! Rhodesia : Highlands of Batoka Country, *Kirk* (type) ! Chirinda, *Swynnerton* 444 ! Umtali : Manica ; Odzani River Valley, *Teague* 154 ! Salisbury, *Craster* 3 ! *Rand* 1444 ! Mazoe, *Eyles* 186 ! Victoria, *Munro* 413 ! 1120B ! 1982 ! 1100C !

South Africa. Transvaal : Barberton, *Thorncroft* 1074 !

30. **D. gnaphaloides** *Matt.* in Boll. Ort. Bot. Palermo vii : 112 (1908).

TROPICAL AFRICA. Somaliland : Torda ; Goscia, abundant about the plains and dunes, *Macaluso* (type).

NATIVE NAME : Bisciar.

I have not seen a specimen of this species, but from description it seems to come very near *D. Kirkii*.

31. **D. Poggei** *O. Hoffm.* in Engl. Bot. Jahrb. 15 : 546 (1893).

TROPICAL AFRICA. Belgian Congo : Lunda, 8·5° S., Dec. 1875, *Pogge* 254.

I have not seen a specimen of this species, but from description it apparently comes near to *D. Kirkii* and is distinguished from that species as shown in the key.

32. **D. speciosa** *DC.* Prodr. 7 : 37 (1838); Harv. in Fl. Cap. 3 : 518 (1865).

SOUTH AFRICA. Natal : *Gerrard* 443 ! between Omsanculo and Oncomas, *Drège* (type) ! between Umzinikulu River and Umkomanzi River, *Drège* 1839 ! Field's Hill, *Wood* 3160 ! Ichanga, *Wood* 13007 ! *Cooper* 2567 !

33. **D. quinquenervia** *Baker* in Kew Bull. 1895 (290).—*D. superba* S. Moore in Journ. Linn. Soc. Bot. 37 : 336 (1906).

TROPICAL AFRICA. Angola : Bailundo District; Benguella, *Wellman* ! rather rare in young forests towards Catombe, *Gossweiler* 1216 ! Kakanda, *Gossweiler* 1752 ! Tanganyika Territory : hills near Chomo River, Mwera, *Carson* 4 (type) ! Mount Kundelunja, *Kassner* 2727 ! Rhodesia : Chibanga, *Rogers* 8528 ! Mumbwa, *Macaulay* 803 !

34. **D. vaginata** *O. Hoffm.* in Engl. Bot. Jahrb. 30 : 442 (1902).

TROPICAL AFRICA. Tanganyika Territory : Kinkagebirge; above Ikombe, on dry stony slopes, about 1200 m., fl. Sept. 1899, *Goetze* 1178 (type).

Native Name : Litoni.

I have not seen a specimen of this plant.

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## XLII.—CONTRIBUTIONS TO THE FLORA OF SINALOA: IV.*

L. A. M. RILEY.

LEGUMINOSAE, subfamily CAESALPINIOIDEAE.

**Caesalpinia bonducella** (*L.*) *Fleming;* Mart. Fl. Bras. xv. pars 2, 65, t. 21 ; Fawcett and Rendle, Fl. Jam. iv. part 2, 93, fig. 32.—*Guilandina bonducella* L. Sp. Pl. ed. 2, 545. *Caesalpinia Crista* L. Sp. Pl. ed. 1, 380, partim; CNH ; xxiii. 422.

Along beaches on both coasts of Mexico (Standley).

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* Continued from *K.B.* 1923, p. 346.

**C. cacalaco** *H. et B.* Pl. Équinox. ii. 173, t. 137; Fernald in Bot. Gaz. xx. 534; CNH. xxiii. 423.

Ocean Beach, near Mazatlan, *Lamb* 363; without locality, *Gonzalez* 671.

Vernacular name "Huisache".

Fernald (l.c.) says that Lamb's specimen has stout recurved spines scattered along the rhachis of one of the leaves, the remaining leaves being unarmed. Lamb's number 363 is represented by a sheet at Kew, but I can discover no trace of spines on any leaf rhachis. On the other hand, Jurgensen's number 619 from Mexico (Sierra San Pedro Nolasco, Talea, etc.), of which there are two sheets at Kew, has one leaf with prominently spiny stipels, the other leaves showing no trace of spines. Humboldt and Bonpland (l.c.) describe the leaves as being unarmed.

**C. coriaria** (*Jacq.*) *Willd.*; CNH. xxiii. 422.—*Poinciana coriaria* Jacq. Stirp. Amer. 123, t. 175, fig. 36.

Sinaloa (fide Standley).

**C. eriostachys** *Benth.*; CNH. xxiii. 424.

San Ignacio; Cerro Prieto, 280 m., *Gonzalez* 117.

Vernacular name "Iguano".

**C. mexicana** *A. Gray* in PAA. v. 157 (1862); CNH. xxiii. 426.

Mazatlan, *Lamb* 341.

Lamb's specimen was determined at the Gray Herbarium as *C. mexicana* var. *pubescens* Robins. et Greenm. (PAA. xxix. 386; 1894). It agrees with the description of that variety in having the leaflets softly pubescent, but the petals are not ciliolate with stipitate glands. Standley says that the species is variable.

**C. Ortegae** *Standley* in Journ. Wash. Acad. Sc. xiii. 6 (1923).

Choix; La Peonia, 600 m., *Gonzalez* 890.

Vernacular name "Tabachín simarrón."

Well distinguished from the related Mexican species by the extraordinary abundance of stipitate glands on all parts of the plant (Standley).

**C. Palmeri** *S. Wats.* in PAA. xxiv. 47 (1889); CNH. xxiii. 426.

Sinaloa (fide Standley).

**C. platyloba** *S. Wats.* l.c. xxi. 425 (1886); CNH. xxiii. 423.

San Ignacio; Arroyo de Campanillas, 360 m., *Gonzalez* 601.

Vernacular names "Palo colorado", "Arellano".

Gonzalez' specimen consists only of flowers and young leaves, whereas the Kew material, with which I have compared it, shows only fruit and mature leaves. Sinaloa is included in the distribution of *C. platyloba* by Standley.

**C. pulcherrima** (*L.*) *Swartz*; Fawcett and Rendle, Fl. Jam. iv. part 2, 95; CNH. xxiii. 424.—*Poinciana pulcherrima* L.; SBH. 281; Britton and Millsp. Bahama Fl. 174.

Cultivated in the gardens of Mazatlan and San Sebastian, and in some parts run wild (Seemann). San Ignacio; Colompo, 250 m., *Gonzalez* 426.

Vernacular names, "Tabachil", "Tabachín", "Tabachino", "Tabaquín".

**C. sclerocarpa** *Standley* in CNH. xx. 214 (1919); CNH. xxiii. 423.

Between Rosario and Acaponeta, *Rose* 1870; Guadalupe, *Rose, Standley and Russell* 14748; near Colomas, *Rose* 3241.

Vernacular name "Ebano".

**Haematoxylon brasiletto** *Karst.* Fl. Columb. ii. 27, t. 114; CNH. xxiii. 419.—*H. boreale* S. Wats.; Zoe, v. 201. *H. campecheanum* Seem. Bot. Herald, 281 (1856), non L.

Common between Mazatlan and San Sebastian (Seemann). Culiacan, *Brandegee*. San Ignacio; El Limon, 210 m., *Gonzalez* 128.

Vernacular name "Brasil".

Standley reduces the Mexican *H. boreale* to the Colombian *H. brasiletto*. On the whole the Mexican specimens seem to have more anfractuose, more spiny and paler branchlets, and relatively broader fruits.

**Delonix regia** (*Boj.*) *Raf.*; CNH. xxiii. 427.—*Poinciana regia* Boj.; Bot. Mag. t. 2884.

San Ignacio; Hacienda de la Cana, 380 m., *Gonzalez* 850. Widely cultivated in Mexico as a shade tree and sometimes growing without cultivation (Standley).

Vernacular names, "Tabachín", "Tabuchín".

The genera *Poinciana* L. (1753) and *Poincia* Neck. (1790) were based on *P. pulcherrima* L. The genus typified by *P. regia* Boj. should bear the name *Delonix*, as has been recognized by Merrill (Philipp. Journ. Sc., Bot. v. 52) and Gamble (Fl. Madras, 396).

**Conzattia sericea** *Standley* in CNH. xxiii. 428 (1922).

Culiacan: Ymala; Rio de Tamazula, 80 m., *Gonzalez* 4169 (ex Standley).

Vernacular name "Navío".

**Parkinsonia aculeata** *L.*; Zoe, v. 201; CNH. xxiii. 428.

Culiacan, *Brandegee*. San Ignacio; Laguna Seca, 40 m., *Gonzalez* 201.

Vernacular name "Retama".

**Cassia atomaria** *L.*; Benth. in Trans. Linn. Soc. xxvii. 548; CNH. xxiii. 410.

Sinaloa (fide Standley).

**C. biflora** *L.*; Benth. l.c. 543; CNH. xxiii. 409.

San Ignacio; Cerro del Aguajito, 520 m., *Gonzalez* 576.

Vernacular names "Vara prieta", "Biche silvestre".

**C. emarginata** *L.*; Benth. l. c. 548; CNH. xxiii. 410.

San Ignacio; Piedras de Lumbre, 50 m., *Gonzalez* 146.

Vernacular name "Mora hedionda".

In Sinaloa the leaves are applied to allay the pain of insect stings (Standley).

**C. laevigata** *Willd.*; Benth. l. c. 527; CNH. xxiii. 407.
Sinaloa (fide Standley).

**C. leptadenia** var. **jaliscensis** *Greenm.* in PAA. xli. 239 (1905).—*C. Chamaecrista* Hemsl. Biol. i. 329 (1880) partim, non L.
Cerro de Pinal, fr. Dec. 1848, *Seemann* 1528. San Ignacio; Las Trompetas, 600 m., *Gonzalez* 507.
The Sinaloa specimens differ from typical *C. leptadenia* var. *jaliscensis* in the stouter, more shortly stipitate petiolar glands, and the somewhat larger flowers.

**C. leptocarpa** *Benth.* in Linnaea xx. 528 (1849); et in Trans. Linn. Soc. xxvii. 531; CNH. xxiii. 404.
Sinaloa (fide Standley).
Vernacular name "Viche".

**C. occidentalis** *L.*; Benth. in Trans. Linn. Soc. xxvii. 532; CNH. xxiii. 404.
Sinaloa (fide Standley).

**C. oxyphylla** *Kunth*, Mimos. 129, t. 39 (1823); Benth. l.c. 521, t. 61; CNH. xxiii. 406.
Sinaloa (fide Standley).
Vernacular name "Casia fistula".
Plant used in Sinaloa as an emetic.

**C. pauciflora** *H.B.K.* Nov. Gen. vi. 360 (1823); SBH. 281; Benth. l.c. 559; Hemsl. Biol. i. 333; CNH. xxiii. 403.—*C. punctulata* Hook. et Arn. Bot. Beech. 420 (1841).
Cerro de Pinal, fl. and fr. Dec. 1848, *Seemann* 1537. San Ignacio: Cerro del Aguajito; Campanillas, 66 m., *Gonzalez* 579.
Vernacular name "Bejuco".
*C. pauciflora* was collected by Humboldt and Bonpland at La Venta del Peregrino, 1080 ft., in Guerrero, about 30 miles (52 miles by road) north-north-east of Acapulco. The leaflets are described as 4–5 lines long, viscous and glabrous, and obtuse. The species accepted by Seemann, Bentham, and others as *C. pauciflora* H.B.K. differs from Kunth's description in several respects. The leaflets are not glabrous, are often more than 4–5 lines long, and possess a distinct mucro, which latter is not mentioned by Kunth. The racemes, also, can hardly be described as few-flowered. Its distribution is from Sinaloa to Nicaragua. As there is no other species known from the neighbourhood of Acapulco which can be referred to *C. pauciflora*, it seems possible that the identification may be correct, and it is therefore desirable to retain the name for the present.

**C. rotundifolia** *Pers.*, var. **bauhiniifolia** (*Kunth*) *Benth.* l.c. 570; Mart. Fl. Bras. xv. pars 2, 162; Hemsl. Biol. i. 334.—*C. rotundifolia* var. *fabaginifolia* Benth. ex Seem. Bot. Herald, 281. *C. bauhiniifolia* Kunth, Mimos. 123, t. 37 (1823). *C. fabaginifolia* H.B.K. Nov. Gen. vi. 363 (1824).
Cerro de Pinal, fr. Dec. 1848, *Seemann* 1536. San Ignacio; San Agustin, 200 m., *Gonzalez* 622.

**C. Tora** *L.*; Benth. l.c. 535; CNH. xxiii. 405.

Sinaloa (fide Standley).

Vernacular name "Biche manso".

**Bauhinia chlorantha** *Brandegee* in Zoe, v. 200 (1905).—*B. longiflora* Rose in CNH. x. 97 (1906); Standley in CNH. xxiii. 415.

Culiacan, *Brandegee*; Ymala, *Palmer* 1426.

Standley (l.c.) unites *B. chlorantha* and *B. longiflora*, and for some unexplained reason adopts the later name.

**B. latifolia** *Cav.* Ic. Pl. v. 4, t. 405 (1799); CNH. xxiii. 418.

San Ignacio; Arroyo de Palmarito, 230 m., *Gonzalez* 617.

Vernacular names "Pata de cabra", "Pié de cabra", "Guacimilla cimarrona".

**Tamarindus indica** *L.*; Rose in CNH. v. 225; Kew Bull. Add. Ser. ix. 275; Popenoe, Man. Trop. Fruits, 432, t. 56.

Grown all over tropical Mexico (Rose, l.c.).

[**Hymenaea Courbaril** *L.*; CNH. viii. 164, t. 41; CNH. xxiii. 413.—*H. Candolleana* H.B.K. Nov. Gen. vi. 323, t. 566.

Tepic; Acaponeta; Falda del Cerro Cuatepec, 40 m., *Gonzalez* 1122.

Vernacular name "Guapinole".

Probably occurs in Sinaloa, but I have seen no specimens from that state.]

LEGUMINOSAE, subfamily MIMOSOIDEAE.

**Entada polystachya** (*L.*) *DC.* Mém. Légum. xii. 434, tt. 61, 62; Benth. in Trans. Linn. Soc. xxx. 364; CNH. xxiii. 349.—*Mimosa polystachya* L.; Jacq. Sel. Stirp. 265, t. 183, fig. 93.

Sinaloa (fide Standley).

**Piptadenia constricta** (*Mich. et Rose*) *Macbride*; CNH. xxiii. 354.—*Goldmania constricta* Mich. et Rose in Mém. Soc. Phys. Nat. Hist. Genève, xxxiv. 274, t. 20 (1903).

Mazatlan, Observation Hill, *Rose* 3107.

**Goldmania foetida** (*Jacq.*) *Standley*; CNH. xxiii. 354.—*Mimosa foetida* Jacq. Hort. Schoenbr. iii. 73, t. 390. *Piptadenia foetida* Benth. l.c. 366. *Goldmania platycarpa* Rose apud Micheli, l.c.

Culiacan, *Goldman* 371.

Vernacular name "Cusa".

**Prosopis juliflora** (*Swartz*) *DC.*; Benth. l.c. 377; CNH. xxiii. 351.—*Mimosa juliflora* Swartz.

Cosalá; Conitaca, 150 m., *Gonzalez* 811.

Vernacular name "Mezquite".

**Neptunia plena** (*L.*) *Benth.* in Hook. Journ. Bot. 1842, iv. 355; CNH. xxiii. 354.—*Mimosa plena* L.

Sinaloa (fide Standley).

**Mimosa affinis** *Robinson* in Bot. Gaz. xvi. 341 (1891); PAA. xxxiii. 312.

Grassy land near Mazatlan, *Wright* 1218, 1265; without locality, *Gonzalez* 229.

Vernacular names "Sensitiva", "Diente de Culebra".

**M. albida** *H. et B.*; Benth. in Trans. Linn. Soc. xxx. 390; Robinson in PAA. xxxiii. 310; CNH. xxiii. 360.

Sinaloa, *Rose* 1731.

A peculiar form with broad very obtuse leaflets (Robinson l.c.).

**M. coelocarpa** *Robinson* in PAA. xxxiii. 319 (1898); CNH. xxiii. 360.

Topolobampo, *Palmer* 187.

**M. distachya** *Cav.*; Benth. l.c. 417; PAA. xxxiii. 316; Zoe, v. 199; CNH. xxiii. 359.

Mazatlan, *Rose* 1393; near Altata, *Brandegee*.

**M. eurycarpa** *Robinson* in PAA. xxxiii. 322 (1898); CNH. xxiii. 363.—*M. eurycarpoides* Robinson in PAA. xxxvi. 472 (1901).

Foothills of Sierra Madre, near Colomas, *Rose* 1805; between Acaponeta and Rosario, *Rose* 3157.

"It is possible that *M. eurycarpoides* is distinct, but it is known only from flowering branches, which show no essential differences from *M. eurycarpa*. The fruit originally described as belonging to *M. eurycarpoides* is probably that of *Acacia Farnesiana*" (Standley).

**M. Grahami** *A. Gray*; SBH. 282; Benth. l.c. 428; Hemsl. Biol. i. 348.

Sierra Madre, *Seemann* 2196.

**M. guatemalensis** (*Hook. et Arn.*) *Benth.*; Benth. l.c. 414; Hemsl. Biol. i. 348; PAA. xxxiii. 315; CNH. xxiii. 359.—*Inga guatemalensis* Hook. et Arn.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1538; near Colomas, *Rose* 3200.

**M. invisa** *Mart.*; Mart. Fl. Bras. xv. pars 2, 379, t. 97; Benth. l.c. 436; Robinson in PAA. xxxiii. 329; CNH. xxiii. 363.—*M. Ervendbergii* A. Gray, partim.

Mazatlan, *Lamb* 329.

Robinson (l.c.) refers to Lamb's specimen (distributed as *M. Ervendbergii*) as a noteworthy form with straighter spines and longer, less pubescent, unarmed peduncles.

**M. manzanilloana** *Rose* in CNH. i. 326 (1895); PAA. xxxiii. 309; CNH. xxiii. 361.

Sinaloa (fide Standley).

**M. Palmeri** *Rose*, l.c. 99 (1891); PAA. xxxiii. 318; Zoe, v. 199; CNH. xxiii. 360.

Common about Cofradia, *Brandegee*. San Ignacio; El Aguajito, *Gonzalez* 442.

Vernacular name "Cuilón".

**M. pigra** *L.*; CNH. xxiii. 362.—*M. asperata* L.; Benth. l.c. 437. *M. asperata* var. *Berlandieri* Robinson in PAA. xxxiii. 331; Zoe, v. 199. *M. Berlandieri* A. Gray.

Sinaloa, *Lamb* 511; without locality, *Brandegee*.

Robinson (l.c.) considers Lamb's specimen intermediate between typical *M. asperata* and the variety *Berlandieri*.

**M. polyantha** *Benth.* in Hook. Journ. Bot. 1842, iv. 410; PAA. xxxiii. 317; Zoe, v. 199; CNH. xxiii. 359.

Abundant about Culiacan, *Brandegee*.

Vernacular name "Arrendador".

According to Brandegee the variety *levior* Robinson, which has glabrous fruits, is also abundant in the same locality.

**M. purpurascens** *Robinson* in PAA. xxxiii. 317 (1898); CNH. xxiii. 359.

Sinaloa (fide Standley).

Vernacular names "Cuca", "Cuilón", "Iguano".

In Sinaloa the bark is used for tanning skins and it is sometimes chewed to harden the gums (Standley).

**M. spirocarpa** *Rose* in CNH. iii. 316, t. 11 (1895); PAA. xxxiii. 315; Zoe, v. 199; CNH. xxiii. 358.

Culiacan, *Palmer* 1476 H., *Brandegee*; between Rosario and Colomas, *Rose* 1606.

**Leucaena lanceolata** *S. Wats.* in PAA. xxi. 427 (1886); CNH. xxiii. 368.

Sinaloa (fide Standley).

**L. microcarpa** *Rose* in CNH. v. 141 (1897); CNH. xxiii. 368.

Sinaloa (fide Standley).

According to Rose (CNH. v. 229), at Colomas the country people use the bark of a species of *Leucaena* called "Tepahuaje" to harden their gums. Standley (CNH. xxiii. 369) gives "Tepeguaje" as a vernacular name of *L. pulverulenta* (Schlecht.) Benth. but this species does not apparently occur on the Pacific slope. The names "Tepeguaje" and "Tepehuaje" are also used for species of *Lysiloma*.

**Acacia angustissima** (*Mill.*) *Kuntze*; CNH. xxiii. 381.—*Mimosa angustissima* Mill. *Acacia insignis* Mart. et Gal. in Bull. Acad. Brux. x. pars 2, 315 (1843). *A. ficina* Benth. in Trans. Linn. Soc. xxx. 532, partim.

San Ignacio; Lagunillas, 380 m., *Gonzalez* 492.

Vernacular name "Guajillo" (Standley).

Gonzalez' specimen agrees with *Galeotti* 3303 (*A. insignis*) which has slightly larger capitula than Miller's type.

**A. crinita** *Brandegee* in Zoe, v. 198 (1905); CNH. xxiii. 380.

Cerro Colorado, *Brandegee*.

**Acacia cymbispina** *Sprague et Riley*, nom. nov.; affinis *A. cochliacanthae* Humb. et Bonpl., quacum hucusque confusa, pinnis foliolisque pluribus, floribus luteis, lobis corollae brevibus latis pilosis differt.

*Caules* annotini lignosi, tortuosi vel subanfractuosi, sparse cinereopuberuli, 3 dm. infra apicem 3 mm. diametro, hornotini densius cinereo-puberuli; spinae ramulorum fertilium subulatae, 3–5 mm. longae, basi usque ad dimidium longitudinem puberulae, ramulorum sterilium cymbiformes, acutissimae, 4–4·5 cm.

longae, cinereae, papillis minutis obtectae. *Folia* 3·5–10 cm. longa, petiolo 0·9–1·3 cm. longo cinereo-puberulo glandulam unicam crassam versus apicem gerente, rhachi ut petiolo minute pubescente eglandulosa glandula inter par pinnarum terminale excepta; pinnae 6–18-jugae, jugis circiter 4 mm. remotis; foliola 16–28-juga, oblongo-linearia, obtusa, basi subauriculata, 1·5–2 mm. longa, 0·5 mm. lata, supra glabra, subtus minute papillata, marginibus sparsissime ciliolatis, costa conspicua fere mediana. *Capitula* axillaria, gemina, 6–7 mm. diametro staminibus inclusis, circiter 35-flora, pedunculis 1·4–2 cm. longis cinereo-puberulis. *Flores* sessiles, lutei. *Calyx* campanulatus, 1·25 mm. longus, puberulus, fere truncatus vel lobis leviter sinuatis, dimidium corollae aequans. *Corolla* 2·5 mm. longa, minute puberula, 4-lobata, lobis deltoideis obtusiusculis, sinibus inter lobos vix 0·5 mm. longis. *Stamina* corollam circiter 1 mm. superantia. *Stylus* 1·75 mm. longus. *Ovarium* stipitatum, 1·5 mm. longum, 14-ovulatum, prima visu glabrum, versus apicem inconspicue et sparse appressi-pilosum. *Legumen* compressum, stipitatum, falcatum, coriaceum, apice angustato-obtusum, circiter 4·5 cm. longum, 8–9 mm. latum, glabrum, pilis paucis minimis exceptis.—*Mimosa campeacheana* Mill. Gard. Dict. ed. 8, *Mimosa* no. 20 (1768). *Acacia cochliacantha* S. Wats. in PAA. xxi. 427 (1886) et xxiv. 49 (1889); Safford

## ERRATA.

*Kew Bulletin*, 1923.

Page 394, line 31, for *fiicina* read *filicina*.
Page 396, line 34, for **acapulcensis** read **acapulcense.**
Page 397, line 3, for *divaricata* read *divaricatum*.

belongs here, but the fruits are only slightly compressed, and are abruptly rounded at the apex with a small apiculus instead of being gradually narrowed.

Houston's specimens (the type of *Mimosa campeacheana*) are without flower or fruit, but agree with the other material above cited in the spines and leaves. The description of *A. cymbispina* has been drawn up mainly from Palmer's no. 101.

The new name *Acacia cymbispina* is required as the name *A. campeacheana* has been used for another species by Schenck (Fedde, Repert. xii. 361, 1913; Engl. Jahrb. l. Suppl. 465, 1914).

**A. Farnesiana** (*L.*) *Willd.*; SBH. 282; Benth. in Trans. Linn. Soc. xxx. 502; Hemsl. Biol. i. 352; CNH. xxiii. 378.—*Mimosa Farnesiana* L.

Sierra Madre, common throughout the region, covering large districts of the tableland of Durango, *Seemann* 2197. San Ignacio: R. de los de Ponce, 260 m., *Gonzalez* 131.

Vernacular names "Binorama", "Vinorama", "Visacha".

**A. gladiata** *Safford* in Journ. Wash. Acad. Sc. v. 359, fig. 2 (1915); CNH. xxiii. 374.

Rosario, *Gregg* 1135.

longae, cinereae, papillis minutis obtectae. *Folia* 3·5–10 cm. longa, petiolo 0·9–1·3 cm. longo cinereo-puberulo glandulam unicam crassam versus apicem gerente, rhachi ut petiolo minute pubescente eglandulosa glandula inter par pinnarum terminale excepta; pinnae 6–18-jugae, jugis circiter 4 mm. remotis; foliola 16–28-juga, oblongo-linearia, obtusa, basi subauriculata, 1·5–2 mm. longa, 0·5 mm. lata, supra glabra, subtus minute papillata, marginibus sparsissime ciliolatis, costa conspicua fere mediana. *Capitula* axillaria, gemina, 6–7 mm. diametro staminibus inclusis, circiter 35-flora, pedunculis 1·4–2 cm. longis cinereo-puberulis. *Flores* sessiles, lutei. *Calyx* campanulatus, 1·25 mm. longus, puberulus, fere truncatus vel lobis leviter sinuatis, dimidium corollae aequans. *Corolla* 2·5 mm. longa, minute puberula, 4-lobata, lobis deltoideis obtusiusculis, sinibus inter lobos vix 0·5 mm. longis. *Stamina* corollam circiter 1 mm. superantia. *Stylus* 1·75 mm. longus. *Ovarium* stipitatum, 1·5 mm. longum, 14-ovulatum, prima visu glabrum, versus apicem inconspicue et sparse appressi-pilosum. *Legumen* compressum, stipitatum, falcatum, coriaceum, apice angustato-obtusum, circiter 4·5 cm. longum, 8–9 mm. latum, glabrum, pilis paucis minimis exceptis.—*Mimosa campeacheana* Mill. Gard. Dict. ed. 8, *Mimosa* no. 20 (1768). *Acacia cochliacantha* S. Wats. in PAA. xxi. 427 (1886) et xxiv. 49 (1889); Safford in Journ. Wash. Acad. Sc. v. 360 (1915) in obs.; Standley in CNH. xxiii. 373 (1922); non Humb. et Bonpl.

Sonora: Guaymas, *Palmer* 101, Bazadehuachi, *Hartman* 251. Chihuahua: Hacienda San Miguel, *Palmer* 71. Sinaloa (fide Safford l.c.). Jalisco: Barranca near Tequila, *Pringle* 4428 (thornless form). Colima: *Palmer* 1353. Vera Cruz, *Houston*.

A specimen from Acapulco (Guerrero), *Palmer* 305, probably belongs here, but the fruits are only slightly compressed, and are abruptly rounded at the apex with a small apiculus instead of being gradually narrowed.

Houston's specimens (the type of *Mimosa campeacheana*) are without flower or fruit, but agree with the other material above cited in the spines and leaves. The description of *A. cymbispina* has been drawn up mainly from Palmer's no. 101.

The new name *Acacia cymbispina* is required as the name *A. campeacheana* has been used for another species by Schenck (Fedde, Repert. xii. 361, 1913; Engl. Jahrb. l. Suppl. 465, 1914).

**A. Farnesiana** (*L.*) *Willd.*; SBH. 282; Benth. in Trans. Linn. Soc. xxx. 502; Hemsl. Biol. i. 352; CNH. xxiii. 378.—*Mimosa Farnesiana* L.

Sierra Madre, common throughout the region, covering large districts of the tableland of Durango, *Seemann* 2197. San Ignacio: R. de los de Ponce, 260 m., *Gonzalez* 131.

Vernacular names "Binorama", "Vinorama", "Visacha".

**A. gladiata** *Safford* in Journ. Wash. Acad. Sc. v. 359, fig. 2 (1915); CNH. xxiii. 374.

Rosario, *Gregg* 1135.

**A. Hindsii** *Benth.* in Hook. Lond. Journ. Bot. 1842, i. 504; Safford in Journ. Wash. Acad. Sc. iv. 365; Standley in CNH. xxiii. 375, excl. syn. *A. sinaloensis* Safford.

Near Colomas, *Rose* 1766.

**A. lutea** (*Mill.*) *Hitchc.*—*Mimosa lutea* Mill. *A. macracantha* Benth. in Trans. Linn. Soc. xxx. 500, partim; Standley in CNH. xxiii. 374; non Humb. et Bonpl.

Sinaloa (fide Standley).

*Acacia lutea* cannot be conspecific with *A. macracantha*, which is described and figured (H. et B. Pl. Légum. 95, t. 28) as having the corolla three times as long as the calyx. I have seen no specimens from Mexico. *Acacia lutea* Leavenworth being a synonym of *Neptunia lutea* Benth., the combination *Acacia lutea* (Mill.) Hitchc. is valid under International Rules.

**A. millefolia** *S. Wats.* in PAA. xxi. 427 (1886); CNH. xxiii. 377.

Sinaloa (fide Standley).

**A. occidentalis** *Rose* in CNH. viii. 32 (1903); CNH. xxiii. 382.

Sinaloa (fide Standley).

**A. pennatula** (*Schlecht. et Cham.*) *Benth.*; Benth. in Trans. Linn. Soc. xxx. 499; CNH. xxiii. 379.—*Inga pennatula* Schlecht. et Cham.

San Ignacio: San Juan, 300 m., *Gonzalez* 361.
Vernacular name "Espino".

**A. riparia** *H. B. K.*; Benth. l.c. 528; CNH. xxiii. 382.

Cosalá: Conitaca; Las Trancas, 130 m., *Gonzalez* 820.
Vernacular name "Gatuño blanco".

**A. Rosei** *Standley* in CNH. xx. 187 (1919); CNH. xxiii. 380.

Mazatlan, *Rose, Standley and Russell* 13673.

**A. sinaloensis** *Safford* in Journ. Wash. Acad. Sc. iv. 365 (1914).—*A. Hindsii* Standley in CNH. xxiii. 375, partim, non Benth.

Villa Union, fr. April, *Rose, Standley and Russell* 13972.

Apparently distinct from *A. Hindsii*, judging from the description.

**Lysiloma acapulcensis** (*Kunth*) *Benth.*; Trans. Linn. Soc. xxx. 536; CNH. xxiii. 389.—*Acacia acapulcensis* Kunth.

Sinaloa (fide Standley).

Vernacular names "Tepeguaje", "Tepehuaje".

**L. Schiedeanum** *Benth.* in Hook. Lond. Journ. Bot. 1844, iii. 83; Bot. Sulph. 91, t. 31; Trans. Linn. Soc. xxx. 535.—*L. divaricatum* Macbride, sed vix *Mimosa divaricata* Jacq.; CNH. xxiii. 390.

Sinaloa (fide Standley).

Vernacular name "Tepeguaje".

*Lysiloma Schiedeanum*, though dedicated to Schiede, was actually described by Bentham from specimens collected by Sinclair on the west coast of Central America. Schiede's specimen from the Hacienda de la Laguna, Vera Cruz, consisted merely of a sterile branch. Hence Sinclair's specimen should be regarded as the type of *L. Schiedeanum*. Bentham considered

*Mimosa divaricata* Jacq. conspecific with *L. Schiedeanum*. Macbride accepted this identification and proposed the new combination *Lysiloma divaricata* (Jacq.) for the species. Jacquin (Pl. Hort. Schoenbr. iii. 76, t. 395) both described and figured the calyx-lobes and corolla-lobes of *M. divaricata* as acute, and further described the corolla as glabrous and the pinnae as bearing forty pairs of leaflets. Bentham described *L. Schiedeanum* as having the corolla externally puberulous, the pinnae bearing twenty to thirty pairs of leaflets, and an examination of Sinclair's specimen shows that the corolla-lobes are obtuse, and the calyx-lobes rounded. There seems to be no reason for uniting the two species.

**L. Watsoni** *Rose* in CNH. i. 99 (1891); Zoe, v. 200.

Cofradia, *Brandegee*.

Standley (CNH. xxiii. 390) says that *L. Watsoni* is known only from the vicinity of the type locality, Alamos, Sonora. I have not seen Brandegee's specimen.

**L.** sp.; Zoe, v. 200.

Brandegee (l.c.) records a *Lysiloma* from Sinaloa thus:—"Nearly glabrous, with large semicordate stipules that persist. Collected only in flower. Near the plant collected by Pringle in Rincon Mts., 1884."

**Calliandra Coulteri** *S. Wats.* in PAA. xvii. 352 (1882); Zoe, v. 199.—*C. formosa* Standley in CNH. xxiii. 388, partim, non Benth.

Near Culiacan, *Brandegee*.

"A form with 14–15 pairs of narrow leaflets and often four pairs of pinnae." (Brandegee, l.c.).

Standley (l.c.) says that *C. Coulteri* may be distinct from *C. formosa* (Kunth) Benth. Comparison of *Palmer* 2129 (the type number) with the plate and description of *Acacia formosa* Kunth (Mimos. 102, t. 32) shows that *C. Coulteri* differs in having more numerous and much smaller leaflets, and smaller stipules which are lanceolate and acuminately acute instead of being oblong and obtuse.

**C. grandiflora** (*L'Hérit.*) *Benth.* in Hook. Journ. Bot. 1840, ii. 139; et in Hook. Lond. Journ. Bot. 1844, iii. 111; SBH. 282; Benth. in Trans. Linn. Soc. xxx. 557; Hemsl. Biol. i. 357; Zoe, v. 199.—*Mimosa grandiflora* L'Hérit. Sert. Angl. 30 (1788); Ait. Hort. Kew. ed. i, iii. 441 (1789); Andr. Bot. Rep. ix. t. 592 (1810); Ait. Hort. Kew. ed. 2, v. 469 (1813). *Inga anomala* Kunth, Mimos. 70, t. 22 (1820). *Calliandra Kunthii* Benth. (1840). *C. anomala* Macbride in Contrib. Gray Herb. n.s. lix. 4 (1919); CNH. xxiii. 385.

Cerro de Pinal, fl. Dec. 1848, *Seemann* 1539; Cofradia, *Brandegee*.

Vernacular name "Cabellito".

Macbride has proposed the new combination *Calliandra anomala* (Kunth) for the Mexican species hitherto commonly known as *C. grandiflora* (L'Hérit.). He maintains that "it is

evident from the description of *Mimosa grandiflora* L'Hérit. that it cannot be the same as Kunth's plant *Inga anomala*, which has the divisions of the pinnae usually distinctly confluent and very oblique at base. I think there is no reasonable doubt but that it is rather referable to *C. Houstoni* (L'Hérit.) Benth., a species which varies in the number of pinnae and the degree to which the leaflets are confluent." But there is convincing evidence that *Mimosa grandiflora* is conspecific with *Inga anomala*. L'Héritier described *M. grandiflora* in 1788 from a plant cultivated "in hortis juxta Londinum, imprimis in horto regio Kewensi." It may be assumed, therefore, that the species cultivated at Kew under that name was true *M. grandiflora*; and a contemporary specimen labelled "*Mimosa grandiflora* Kew. Septr." from the Herbarium of Bishop Goodenough, now in the Kew Herbarium, (see Kew Report, 1880, 64; 1881) agrees with the plate and description of *Inga anomala* Kunth. Another contemporary specimen of this species marked "*M. grandiflora*. Hort. Dni. Vere in Kensington Gore 1789" is preserved in the herbarium at the British Museum. *M. grandiflora* was included in the first and second edition of Aiton's Hortus Kewensis, so that it was in cultivation at Kew at any rate until 1813. In the meantime it had been figured in Andrew's Bot. Rep. ix. t. 592 (1810), and this figure was cited by W. T. Aiton in the second edition of the Hortus Kewensis. Andrew's figure, also, represents *Inga anomala*. There is, therefore, no reason for changing the name *Calliandra grandiflora* (L'Hérit.) Benth. Macbride's suggestion that *Mimosa grandiflora* is synonymous with *M. Houstoni* is somewhat surprising in view of the fact that L'Héritier, who had seen both species in a living state, carefully distinguished them. L'Héritier's diagnostic phrase of *M. grandiflora* may not seem very applicable to *Inga anomala*, but it is utterly irreconcilable with *M. Houstoni*.

The material of *C. grandiflora* from Chihuahua, Sinaloa, and Jalisco may possibly represent a distinct variety or even species. The number of pinnae is, on the whole, fewer, the calyx is smaller in proportion to the corolla, and the indumentum of the flowers is composed of short, stiff, appressed, gray hairs, which gives the inflorescence a very different appearance.

**C. Houstoniana** (*Mill.*) *Standley* in CNH. xxiii. 386 (1922).—*Mimosa Houstoniana* Mill.; *Mimosa* sp., Rel. Houst. t. 26 (1781). *M. Houstoni* L'Hérit. Sert. Angl. 30 (1788). *Calliandra Houstoni* Benth.; Trans. Linn. Soc. xxx. 556. *Anneslia falcifolia* Salisb. in W. Hook. Parad. Lond. i. t. 64 (1807). *Acacia metrosideriflora* Schlecht. in Linnaea, xii. 567 (1838). *Acacia americana, non spinosa, flore purpureo, staminibus longissimis, siliquis planis villosis, pinnis foliorum tenuissimis* Houst. ex Mill. Fig. Pl. Gard. Dict. 4, t. 5 (1755).

San Ignacio; Los Sabinos, 280 m., *Gonzalez* 256.
Vernacular names "Day", "Tabardillo".
In Sinaloa the bark is chewed to harden the gums (Standley).

**C. laevis** *Rose* in CNH. v. 194 (1899); CNH. xxiii. 384.
Near Colomas, *Rose* 1753.

**C. portoricensis** (*Jacq.*) *Benth.*; Trans. Linn. Soc. xxx. 543; CNH. xxiii. 388.—*Mimosa portoricensis* Jacq.
Sinaloa (fide Standley).

**C. rupestris** *Brandegee* in Zoe, v. 199 (1905).—*C. emarginata* Standley in CNH. xxiii. 384, partim, non Benth.
Cofradia, *Brandegee*.

Standley (l.c.) reduces *C. rupestris* to *C. emarginata*, but admits that several species may possibly be included under the latter name. According to Brandegee's description of *C. rupestris*, the petioles are longer and the peduncles much shorter than in *C. emarginata*.

**Albizzia occidentalis** *Brandegee* in Proc. Calif. Acad. Ser. 2. iii. 222 (1893); CNH. xxiii. 390.
Sinaloa (fide Standley).
Vernacular names "Palo fierro", "Bolillo", "Arellano".

**A. tomentosa** (*Micheli*) *Standley* in Journ. Wash. Acad. Sc. xiii. 6 (1923).—*Pithecolobium tomentosum* Micheli in Mém. Soc. Phys. Nat. Hist. Genève, xxxiv. 285, t. 28 (1903).
Sinaloa, *Gonzalez* 4554.
Vernacular name "Palo joso".

**Pithecolobium brevifolium** *Benth.* in A. Gray, Pl. Wright. i. 67 (1852); Trans. Linn. Soc. xxx. 592; Standley in CNH. xxiii. 397.
Specimens from Sinaloa are probably conspecific (Standley l.c.).
Vernacular name "Carbonera".

**P. dulce** (*Roxb.*) *Benth.*; SBH. 282; Trans. Linn. Soc. xxx. 572; CNH. i. 328; CNH. v. 216; CNH. xxiii. 393.—*Mimosa dulcis* Roxb.
Agiabampo, *Palmer* 800; West coast of Mexico, *Seemann* 2194; "Cultivated about Mazatlan and San Sebastian and naturalized in some parts" (Seemann); Mazatlan, *Lamb* 326. San Ignacio; Arroyo de los de Ponce, 260 m., *Gonzalez* 135; "found all through tropical Mexico, where it is probably native, but on account of its rapid growth and delicious fruit it has also been much planted" (*Rose*).
Vernacular names "Guamúchil", "Huamúchil".

**P. lanceolatum** (*Humb. et Bonpl.*) *Benth.* in Hook. Lond. Journ. Bot. 1846, v. 105, in obs.; Pittier in CNH. xx. 460; Standley in CNH. xxiii. 393, partim.—*Inga lanceolata* Humb. et Bonpl. ex Willd. Sp. Pl. iv. pars 2, 1005 (1806); Kunth, Mimos. 49, t. 15; DC. Prodr. ii. 437. *Mimosa lanceolata* Poir. in Lam. Encycl. Suppl. i. 37 (1810). *Pithecolobium ligustrinum* Benth. in Trans. Linn. Soc. xxx. 571, partim.
Mazatlan; Villa Union and Rosario, *Rose, Standley and Russell* 13852, 13950, 14520, *Rose* 3162. San Ignacio; R. de los Chinacates, 90 m., *Gonzalez* 159.

Vernacular name "Conche" (Gonzalez).

The material of *Gonzalez* 159 in the Kew Herbarium consists of three branchlets bearing leaves, but without flowers or fruit. The stipular spines are 1–1·7 cm. long, and the "interpetiolar stipules" are subulate, as described by Pittier (l.c.), but the leaflets are pubescent on the lower surface, whereas those of *P. lanceolatum* are glabrous, so far as is known. Flowering material is required in order to verify the identification.

Pittier, who has made a special study of the spicate-flowered species of *Pithecolobium* of the *unguis-cati* section (l.c. 455–464), treats *P. lanceolatum* (Humb. et Bonpl.) and *P. ligustrinum* (Jacq.) as independent species, but Standley (CNH. xxiii. 393) follows Bentham in uniting them. For the combined species Standley adopted the name *P. lanceolatum*, being under the impression that *Mimosa ligustrina* Jacq. was published in 1809, subsequently to *Inga lanceolata* Humb. et Bonpl. (1806) and *Mimosa ligustrina* Vahl (1807). But as Willdenow (Sp. Pl. iv. pars 2, 1007; 1806) cited *Mimosa ligustrina* Jacq. Fragm. 29, t. 32, it is evident that the latter was published previously. The combined species should therefore bear the name *Pithecolobium ligustrinum* (Jacq.) Klotzsch ex Benth.

**P. ligustrinum** (*Jacq.*) *Klotzsch ex Benth.* in Trans. Linn. Soc. xxx. 571 (1875), partim; emend. Pittier in CNH. xx. 461 (1922).—*Mimosa ligustrina* Jacq. Fragm. 29, t. 32, fig. 5 (1800–1806). *Inga ligustrina* Willd. Sp. Pl. iv. pars 2, 1007 (1806); DC. Prodr. ii. 437 (1825). *Pithecolobium lanceolatum* Standley in CNH. xxiii. 393, partim.

Culiacan, *Brandegee*.

**P. mexicanum** *Rose* in CNH. i. 100 (1891); CNH. xxiii. 397.

Sinaloa (fide Standley).

**P. pulchellum** *Pittier* in CNH. xx. 462 (1922).

Culiacan, *Brandegee*.

**P. sonorae** *S. Wats.* in PAA. xxiv. 49 (1889); CNH. xxiii. 397.

Sinaloa (fide Standley).

Vernacular name "Palo gato".

**P. unguis-cati** (*L.*) *Benth.* in Hook. Lond. Journ. Bot. 1844, iii. 200; Standley in CNH. xxiii. 394.—*Mimosa unguis-cati* L.

Sinaloa (fide Standley).

It is possible that this may prove to be some other species. On account of the known geographical distribution of *P. unguis-cati*, its occurrence in Sinaloa is improbable.

Standley ascribes the combination *P. unguis-cati* (L.) to Martius, Hort. Monac. 188 (1829), but this publication is invalid under International Rules, as the genus *Pithecolobium* was not described until 1837.

**Enterolobium cyclocarpum** (*Jacq.*) *Griseb*; CNH. v. 228; CNH. xxiii. 391.

Colomas, *Rose* 1759.

Vernacular names "Huinecastle", "Huinecaztle", "Huinacaxtle".

The bark is used as a soap and in tanning (Rose). The gum which exudes from the trunk is employed in Sinaloa as a remedy for bronchitis (Standley).

**Inga eriocarpa** *Benth.* in Hook. Lond. Journ. Bot. 1845, iv. 615; Hemsl. Biol. i. 362; CNH. xviii. 212; CNH. xxiii. 399.

Sinaloa (fide Standley).

Vernacular name "Vainillo".

Bentham (Trans. Linn. Soc. xxx. 628, in obs.) says that *I. eriocarpa* may be the same species as *I. xalapensis* Benth. *I. eriocarpa* appears to differ in the scarcely acuminate, more coriaceous leaflets, and in the bracts being ovate instead of lanceolate.

**I. oophylla** *Riley*, sp. nov.; affinis *I. eriocarpae* Benth., foliolis ovatis vel ovato-lanceolatis haud coriaceis apice valde mucronatis, indumento sparsiori differt; ab. *I. xalapensi* Benth, foliolis ovatis nunquam acuminatis multo latioribus, indumento sparsiori-bracteis minoribus, inflorescentiis multo laxioribus, floribus paucioribus facile distinguitur.

*Caules* subflexuosi, ferrugineo-tomentosi, lenticellis prominentibus. *Folia* rhachi communi (petiolo incluso) 1·6 dm. longa, ferrugineo-tomentosa, internodiis alatis, alis anguste ellipticis, apice basique angustatis, 2–3·5 cm. longis, 7–9 mm. latis, utrinque sparse pilosis, nodo quoque glandulam albescentem gerente; foliola 4–5-juga, ovata vel ovato-lanceolata, basi oblique subcordata, apice obtusa vel subacuta, valde mucronata, 5·5–12·5 cm. longa, 3·2–4·8 cm. lata, supra nitida, subtus opaca, utrinque sparse pilosa, costa supra densius obtecta. *Inflorescentia* spicata, laxa, 6–7 cm. longa, circiter 7-flora, floribus sessilibus, ubique, corolla excepta, ferrugineo-tomentosa. *Bracteae* ovatae vel ovato-lanceolatae, obtusae, 5–7 mm. longae, 2–5 mm. latae. *Calyx* tubuloso-campanulatus, 1·8 cm. longus, dentibus triangulatis acutiusculis 5–7 mm. longis. *Corolla* 2·5 cm. longa, extus dense sericea, intus glabra, dentibus triangulato-ovatis acutiusculis circiter 6 mm. altis, basi circiter 4 mm. latis. *Stamina* corollam longe superantia ad 7 cm. attingentia. *Ovarium* sessile, quadrangulatum, glabrum. *Legumen* non vidi.

Sinaloa: San Ignacio; El Bosque, 110 m., *Gonzalez* 250 (type in Herb. Kew).

Vernacular name "Vainillo".

**I. xalapensis** *Benth.* in Hook. Lond. Journ. Bot. 1845, iv. 616; Trans. Linn. Soc. xxx. 628; Hemsl. Biol. i. 364; CNH. xviii. 216; CNH. xxiii. 399.

Sinaloa (fide Standley).

Vernacular name "Vainillo".

The wood is used for fence posts (Standley).

## XLIII.—VISIT OF HER MAJESTY THE QUEEN.

Her Majesty the Queen was graciously pleased to pay a visit to the Royal Botanic Gardens, on Tuesday, November 27th in order to plant a specimen of the Maidenhair Tree (*Ginkgo biloba*) on the site of the Temple of the Sun, which was destroyed in the gale of March 1916.

The Temple of the Sun was built in 1761 for Princess Augusta of Saxe-Gotha, Dowager Princess of Wales, from the designs of Sir William Chambers, and occupied a position at about the centre of the Botanic Garden which Her Royal Highness had founded in 1760 and which was the origin of the present Gardens.

Near the site of this Temple stands the fine Maidenhair Tree planted between 1760 and 1762 either by the Princess of Wales or by her botanical adviser, the Earl of Bute, and Her Majesty, by planting a young Ginkgo Tree on this historic spot, has in a very interesting manner maintained the Royal interest in Kew which has existed since 1730, when Frederick Prince of Wales obtained a lease of the property from the Earl of Essex.

The ceremony was a purely private one. Her Majesty was received at the Main Gate of the Gardens by the Director, and walked to the site where the Curator and the tree movers were in waiting, a young tree having been moved into position with the transplanting machine. After the machine and coverings had been taken away and the ball of earth holding the roots laid bare, Her Majesty, using an ordinary garden spade, placed several spits of earth on the roots of the tree.

Before leaving she spoke for some time with each of those who had been concerned with the moving of the tree, and enquired about the surrounding trees, some of which are the oldest exotic specimens in the Gardens. The fine old Ginkgo was also inspected, and Her Majesty was pleased to accept a pressed spray bearing the leaves, and also a photograph of the tree and one showing the Temple of the Sun.

It was very unfortunate that a dense fog enveloped the Gardens on the morning of the planting, yet despite the fog and cold, Her Majesty braved the adverse conditions and most kindly carried out the task which she had promised to perform.

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## XLIV.—MISCELLANEOUS NOTES.

Dr. S. C. Harland.—We learn that Dr. S. C. Harland formerly of the Agricultural Experiment Station, St. Croix, and later Assistant Agricultural Superintendent, St. Vincent, has been appointed Professor of Botany at The Imperial College of Tropical Agriculture, Trinidad, in succession to Mr. T. G. Mason transferred to Nigeria. (*K.B.* 1914, p. 345; 1915, p. 181.)

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Mr. V. H. KIRKHAM, late Director of Chemical Research, Kenya, has been appointed, by the Secretary of State for the Colonies, Director of Agriculture, Zanzibar.

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LIEUT. A. G. BEATTIE has been appointed by the Secretary of State for the Colonies on the recommendation of Kew, Superintendent, Agricultural Department, Nigeria.

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LORD VENTRY.—We record with regret the death of Lieutenant Colonel Lord Ventry, D.S.O., in September. In his later years he took a keen interest in the growing of New Zealand Flax on his estate in Kerry, where it flourished remarkably well. An account of his experiments were published in *K.B.* 1919, p. 169, with illustrations showing the growth of the plant at Burnham, Dingle, Co. Kerry. He was a frequent and always an interesting correspondent of Kew with regard to his experiments with Flax Cultivation, which he pursued with great patience and an optimism that deserved to be rewarded with commercial success.

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**Retirement of Mr. G. T. Lane.**—In February last Mr. G. T. Lane retired from the post of Curator of the Royal Botanic Gardens, Calcutta. Mr. Lane entered Kew as a young gardener in 1889 and after two years' service was appointed Assistant Curator of the Calcutta Gardens, of which he became Curator in 1894.

The Annual Report of the Royal Botanic Gardens, Calcutta, for 1922–23, contains the following record of Mr. Lane's service :—

"With Mr. Lane's retirement on the 2nd February 1923 Government loses an officer of long and faithful service. He first joined the garden staff some thirty-two years ago under the then Superintendent, Sir George King, who early formed a high opinion of his character and abilities. Mr. Lane saw service under several Superintendents and acting Superintendents, and it is sufficient to say that all have left records endorsing the high opinion of him which Sir George King was first in a position to form. His relations with garden labour were particularly happy. Firmness combined with sympathy and tact were amongst Mr. Lane's natural gifts enabling him to command as loyal service from those placed in his charge as he himself never failed to give."

Mr. Lane has been succeeded as Curator at Calcutta by Mr. W. V. NORTH. (*K.B.* 1912, p. 392.)

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**The Imperial College of Tropical Agriculture.**—At a meeting of the West Indian Agricultural College held at the Colonial Office on 3rd October 1923 it was decided that the name of

this Institution should be changed to "The Imperial College of Tropical Agriculture"( *K.B.* 1920, p. 81; 1922, pp. 255, 302).

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**Paintings of Burmese and Madras Plants.**—Colonel W. G. King, I.M.S. (retd.), C.I.E., whose contribution to the library of 10 albums of original paintings of Burmese and Madras plants was announced in the *Kew Bulletin*, 1922, p. 42, has recently presented five other albums of paintings of Burmese plants. The 15 albums contain altogether 1,017 paintings of which 649 were done in Burma and 368 in Madras. All are the unaided and untutored work of his wife, now deceased, accomplished during the years 1886 to 1910. While it is not claimed for these paintings that they possess great artistic merit, they appear on the whole to be faithful representations, and their value is much enhanced owing to the fact that in many instances fruiting specimens have been depicted There are more than 100 paintings of Burmese Cucurbitaceae, mostly including fruits, and many of them have been furnished with names which have been corrected or verified by the late Mr R. A. Rolfe. Much of the work of identification remains to be done, and it is probable that in some cases it can never be completed satisfactorily, for no botanical artist, however talented, is likely to be so fortunate as to succeed, without instruction and supervision, in delineating all the essential characters by which a species may be recognised and distinguished from its allies. Mr. J. S. Gamble has kindly looked over the Madras collection and has tentatively named a portion of it. The paintings have been carefully and neatly mounted, partly, if not entirely, by Colonel King himself, who has also prepared typed lists of them, giving localities and dates where and when the plants were found, such names as have been supplied, and occasional remarks by Mrs. King.

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**The Kendall Australian Collection.**—The Australian collection in the Herbarium has recently received a useful addition through the kindness of the Council of the Royal Geographical Society, by the presentation of about 130 specimens collected by Mr. R. J. Kendall in the sixties, in the vicinity of Castlemain, Victoria. The plants are well pressed and mounted, and form a welcome addition to a flora which is none too well represented at Kew.

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**Flora of West Africa.**—With the approaching completion of the Flora of Tropical Africa, it has been arranged with the Colonies concerned, through the Secretary of State for the Colonies, that a handbook on the flora of West Africa shall be prepared at Kew. This project has been contemplated at Kew for some time and in fact was actually indicated by Sir William Hooker in his memorandum to the Colonial Office in 1863 when he detailed the series of floras required for the Colonies (*K.B.*

1905, p. 20). The demands made by the larger Flora, however, have so far prevented this work being undertaken.

The need of floras dealing with special areas but based on the standard Flora of the Country has already been appreciated in the case of India where the Flora of British India has been followed by the local floras of Bombay, Madras, etc. These local floras have been or are being written by distinguished Indian botanists and the work has been done almost entirely at Kew, the Government of India finding the necessary funds for the purpose.

The retirement of Dr. J. M. Dalziel from the West African Medical Service appeared to be a unique opportunity of securing the services of an officer well acquainted with West Africa and who was known to have taken a keen interest in the local flora during his long residence on the Coast. With this assistance, and that of Mr. J. Hutchinson, who has for so many years devoted his attention to African work in the herbarium at Kew, it has now been possible for work on the local flora to be begun.

The handbook is intended to follow the lines of the local Indian floras and to be illustrated by outline sketches of the more important flowers and plants. The area to be considered will include the four British West African Colonies and Protectorates and as much of the hinterland and intervening country as comprise the common Upper Guinea flora.

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**Donation of a Microscope.**—An important addition to the apparatus at Kew is due to the generosity of Mr. P. G. Dallinger, who has very kindly presented a valuable microscope for the use of the Staff or Students.

The instrument consists of a Zeiss stand with mechanical stage finder, sub-stage condenser and diaphragms, one objective (16 mm.) and three compensating eyepieces by Zeiss, one ordinary eyepiece, a $\frac{1}{6}$-inch objective by Baker and a $\frac{1}{12}$-inch immersion lens by Reichert.

The microscope is in excellent order, the donor having arranged for a thorough overhauling of the instrument to be carried out before presenting it to Kew.

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**The National Herbarium of the Union of South Africa.**—The Botanical Survey of the Union of South Africa was established in the year 1918, as recorded in the *Kew Bulletin* 1919, p. 399, and one of its principal aims was that a Central Herbarium should be established at the headquarters of the Survey at Pretoria. We learn with interest that this has now been accomplished, the Central Herbarium having been opened on July 20th by General Smuts, the Prime Minister.

General Smuts, as reported in the Rand Daily Mail, gave a remarkably interesting scientific address on this occasion, showing how wide is his grasp of South African botany and its needs.

The foundation of this herbarium, he pointed out, has been preceded by three others. The first was the Natal Herbarium which was built up by Dr. Medley Wood, then came the magnificent Bolus collection at Cape Town, now belonging to the Cape University, which was made by one who had devoted his ability and time to botanical collection and research, while the third was the Government herbarium at Cape Town, started many years ago and containing many notable specimens. Most of these specimens were referred to in the earlier volumes of the Flora Capensis.

The herbarium which he was about to open was, he said, the youngest since the Boer War. The man who started it was Mr. Burtt Davy, ably assisted by Mrs. Sydney Stent. On the whole, though he would not say this collection was as great or notable as some of the others, it was already a magnificent one containing well over 35,000 named and mounted specimens. Not only was it a phanerogamic collection but there was also a collection of cryptogams containing the best collection of South African fungi in existence. This collection consists of over 25,000 specimens, and to it will be added Dr. Sim's fine collection from Natal.

Referring to the Botanical Survey, General Smuts said that this was not only of extreme importance, but afforded in many respects an example to other countries. This Survey was presided over by Dr. Pole-Evans, and its success was largely due to his energy and ability.

The Herbarium was an encyclopaedia, the store-room and the laboratory of a botanist, and no progress could be made in botany unless they had a first-class herbarium.

After referring to many interesting points in connection with the flora of the Cape Region, General Smuts pointed out that it was quite possible that proper and intensive study of the botany of South Africa would throw light on many of the great problems that were puzzling the botanists of the world.

Proceeding, he emphasised the fact that if they wanted to know properly the botany of South Africa they would have to review the botany of the African Continent as a whole. "You want a Kew", he said, "What Kew is to England and the British Empire, this national herbarium must be to South Africa. You want here a herbarium to which you can bring together all that vast material of the African Continent which will enable you to see the plant distribution of the whole continent, and then only will you be able to answer some of the questions of the past."

In referring to South Africa's need of a Kew, General Smuts, as reported, made no allusion to the "botanic garden" side of Kew which is already in existence in the National Botanic Garden at Kirstenbosch. It is quite true, as he so ably points out, that a comprehensive herbarium is essential to our knowledge of the flora of a country, but the garden side where the living plant can be studied is of equal importance. It is therefore

much to be hoped that while doing all it can to further the work of the Botanical Survey and help forward the Herbarium, which has been opened under such auspicious circumstances, the Government of South Africa will not in any way neglect to give adequate assistance to the National Botanic Garden, Kirstenbosch. This garden, which was started largely through the initiative of the late Professor Pearson, has great possibilities, and from the Reports that have reached us it does not appear to have received its due meed of recognition and support from Government. We venture to express the hope that a Government which is so enlightened in matters botanical and agricultural as is that of the Union of South Africa, now that it has established so essential an Institution as a National Herbarium, will not neglect its National Botanic Garden, which was founded so wisely a few years ago.

South Africa is singularly fortunate in possessing not only a remarkable flora, which must be most zealously guarded and studied, but also a Prime Minister who knows it so well and appreciates to the full its value and interest. To achieve the attainment of the ends that General Smuts has outlined a Botanical Garden as well tended and provided for as may be possible is essential. In the past the foundation of the Garden has usually preceded the establishment of the Herbarium, but in South Africa the Herbarium appears to have received the greater attention. The new National Herbarium alone cannot be to South Africa what Kew strives to be to Great Britain and the Empire any more than can the Kirstenbosch Garden represent every side of Kew's activities.

If, however, the New National Herbarium and the complementary National Botanic Garden at Kirstenbosch can be coupled together in the matter of adequate financial support so that their united work may be National not merely in name but in fact, then the Union of South Africa will indeed possess a worthy counterpart of "Kew" fitted to answer the botanical and agricultural problems that confront the Country.

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**Cascara Sagrada.**—Considerable interest was aroused a few years ago by a series of articles which appeared in the *Kew Bulletin* on the possibility of the cultivation of *Rhamnus Purshiana* on a commercial scale in the British Isles. The following extract from the Report of the Administrative Chairman of the Honorary Advisory Council for Scientific and Industrial Research of Canada, 1922, indicating that the wood is practically as active as the bark, should prove of value to those interested in the experimental cultivation of these trees.

"The investigations made indicate that the results obtained by storing the bark of the Cascara Sagrada for three years previous to use, can be produced quickly by chemical means; for this purpose the bark is submitted to the action of hydrogen peroxide, and tests made at the Vancouver General Hospital with

bark so treated have been satisfactory. The Cascara Sagrada wood was next examined to see if it contained enough active constituent to pay for extraction; solutions are being tested at the Vancouver General Hospital and by the Parks, Davis Company, Detroit. A preliminary report from the hospital shows the surprising result that the wood is practically as active as the bark, and this result, if fully confirmed, will mean a wonderful conservation of the fast disappearing Cascara tree, as the bark does not constitute more than 5 per cent. of the tree."

The trees at Kew continue to thrive well. The largest, raised from seed sent by Mr. Luther Burbank in 1891, is now 25 ft. high, its trunk (at 3 ft. from the ground) 2 ft. 10 ins. in girth. It is therefore approaching maturity, the dimensions of trees wild in Western North America being given as 20 to 40 ft. in height, the trunk 1 foot or more in diameter. Young trees raised from seed produced at Kew in 1914 are 11 ft. 6 ins. high.

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**Castor Seed and Oil** (*Ricinus communis*).—Considerable interest during the last few years has been taken in this well-known product, of which our chief source in pre-war days was British India (1,203,355 cwt. of seed and 6,640 cwt. of oil imported in 1913), with smaller supplies from foreign countries—Italy, United States, &c. The following note (from the Monthly Bulletin of Agric. Intell., International Institute, Rome, Dec. 1922, p. 1499) may be of interest as showing the developments in Brazil.—"During the war the cultivation of the Castor-oil plant developed enormously in the State of Sao Paulo; it then decreased in importance owing to the rapid fall in prices and difficulties of preparation. At present the export demand has again increased considerably. In 1920 from the port of Santos alone 360,000 bags of castor-oil seed were exported and in 1921 230,000 bags over and above the quantities prepared in Brazilian factories, which have considerably increased their machinery. The price for the first half of 1922 was 460 reis (about 8*d.*) per kilogramme of unhusked seed and 500 reis (8*d.*) for machine husked seeds, or 25 milreis (at 16*d.* = 33*s.* 4*d.*) per bag of 50 kilogrammes. The exporting firms are constantly receiving large orders from Europe and America." In the same Bulletin (p. 1498) cultivation for the French market is strongly recommended in Morocco, where "in the coast zone the climate is very favourable for growing the plant, which lives for about 10 years, assuming an arborescent form; the heavy night dews here render irrigation unnecessary."

The cake after the extraction of the oil is not suitable for feeding cattle, and it is generally used as manure on coffee and other plantations.

The Castor-oil plant was recommended for cultivation in the warmer parts of the British Empire in *Kew Bull.* Nos. 7–8,

1917, p. 245, and particulars of the cultivation, extraction of the oil and uses are given in the *Kew Bull.*, Add. Series ix, part 4 (1922), pp. 607–611. J. H. H.

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**The Botanical Magazine.**—The fourth and concluding part of the new issue of the Botanical Magazine, completing volume cxlviii, has now been issued and maintains the standard set up in the first part.

The plants figured in Parts ii, iii and iv, which have been issued during 1923, though the volume belongs to the previous year, are as follows :—

Part ii.—*Rhododendron sulfureum* Franch. (t. 8946), from South-west China; *Euphorbia anoplia* Stapf (t. 8947), a new dioecious species from South Africa presented by the late Mr. Elwes to the Royal Botanic Gardens, Kew; *Malus toringoides* Hughes (t. 8948), a native of Szechuan originally collected by General-Consul Hosie and Mr. Wilson in 1904; *Maxillaria Fletcheriana* Rolfe (t. 8949), collected by Forget in Southern Peru; *Amorphophallus coffeatus* Stapf (t. 8950), a striking new Aroid collected in Rhodesia and flowered at Kew; *Echinocactus undulatus* Dietr. (t. 8951), from Mexico presented by Mr. Elwes to Kew; *Dracocephalum Isabellae* Forrest (t. 8952), a handsome garden plant collected by G. Forrest in North-West Yunnan; *Rhododendron planetum* Balf. f. (t. 8953), from China probably W. Szechuan; *Cirrhopetalum tripudians* Parish et Reichenb. (t. 8954), collected in Burma by Parish and in Siam by Dr. Kerr; *Lachenalia convallariodora* Stapf (t. 8955), an interesting new South African species and *Lonicera Griffithii* Hook. f. & Thoms. (t. 8956), with pink flowers and dimorphic leaves from the Afghan Indian borderland.

Part iii contains the following plates :—*Isotrema chrysops* Stapf (t. 8957), a new hardy Aristolochiad collected by Henry and by Wilson in China; *Prunus incisa* Thunb. (t. 8958), from Japan; *Milletia dura* Dunn (t. 8959), a slender tree or climbing shrub from Equatorial Africa flowered at Kew from seed sent by Mr. M. T. Dawe; *Lilium centifolium* Stapf (t. 8960), from China; *Dictamnus albus* L. var. *caucasicus* Rouy (t. 8961), a native of the Crimea and Caucasus; *Deutzia pulchra* Vidal (t. 8962), from the Philippines and Formosa; *Rhododendron Cantabile* Balf. f. (t. 8963), a new Chinese species of Forrest's collecting in the mountains N.E. of Chungtien; *Xerophyllum tenax* Nutt. (t. 8964), the Skaw or Indian Basket grass of N.W. America; *Cypripedium himalaicum* Rolfe (t. 8965), from the Himalaya and Western China; *Rhipsalis Warningiana* K. Schum. (t. 8966), a native of Brazil and *Veronica pimeleoides* Hook. f. (t. 8967), an interesting species from the South Island, New Zealand, introduced to cultivation over thirty years ago.

Part iv contains plates of the following plants :—*Hemerocallis nana* G. Forrest & W. W. Smith (t. 8968), from the mountains

of N.W. Yunnan; *Picea brachytyla* Pritzel (t. 8969), also from Western China; *Clethra Delavayi* Franch. (t. 8970), a very beautiful Chinese shrub or small tree with a white corolla and deep rose or red calyx; *Echinocereus Baileyi* Rose (t. 8971), from North America; *Carmichaelia australis* R. Br. (t. 8972), from New Zealand where it was discovered by Sir J. Banks and Dr. Solander in 1769; *Rhododendron sinogrande* Balf. f. & W. W. Smith (t. 8973), from South West Yunnan, the Chinese representative of the Himalayan *R. grande*; *Gentiana rigescens* Franch. (t. 8974), from China; *Haemanthus Lynesii* Stapf (t. 8975), a new species collected at Darfur on the Lake Chad-Nile divide by Admiral Lynes in 1921 and flowered by the late Mr. Elwes; *Wattakaka sinensis* Stapf (t. 8976), a climbing Asclepiad from Western China and *Echium coeleste* Stapf (t. 8977), a beautiful new species from the Canary Islands raised at Kew from seeds sent over by the late Dr. G. V. Perez of Orotava.

The volume is very fittingly dedicated to Mr. George Forrest to whose energy and sagacity in his expeditions in China both Botanists and Horticulturists are so deeply indebted.

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**The Vegetation and Soils of Africa***.—To attempt a review of the vegetation and of the soils of Africa in one small volume is a task that must have been as unsatisfactory to the authors as it is to the readers. More especially is this the case when the authors state that a careful digest has been made of the bibliography which is enumerated in twenty eight pages, as well as many other works they have not cited. It is to be hoped that the vast amount of information which the authors have accumulated in their appreciation of these works will not be confined to these few pages but will be continued in further publications of this series.

Both authors strike an entirely new note in their studies of the vegetation and soils of Africa. The vegetation is treated and summarised on its distinctive physical and physiological features, its floristic composition and affinities not being considered. For instance the Cape vegetation and the "maqui" of the Mediterranean are put in the same class under the heading of Temperate Brush. Even so the author distinguishes twenty-one types. The treatment of the soils is also a new departure for Africa and some very interesting deductions are given as to the possible, or previous, extent of types of vegetation. The synopses on present day agriculture, and the assessment of the types of land in terms of productivity render the book eminently suitable for agriculturists.

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* The Vegetation and Soils of Africa. H. L. Shantz and C. F. Marbut. Research Series, No. 13. American Geographical Society, Broadway at 156 Street, New York, pp. 262, x, 50 illustrations and two maps. Price $5.

The two maps each with an inset illustrating the distribution of vegetation, soil, rainfall and land classification are a valuable addition. The authors are to be congratulated on so lucidly introducing these studies of Africa, and the American Geographical Society on the production of this neatly bound and well illustrated work.

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**The Siamese Flora**†.—The Botanical Section of the Ministry of Commerce, Siam, was formed in 1920 with the object of making a survey of all known and possible economic plants of the country. The result of the 1922 tour has recently been published in The Record, the organ of the Board of Commercial Development, Siam, English Edition No. 9. In addition to the very interesting account of the tour of the Botanical Section there is an article on the Cultivation of "Miang" or Siamese tea. The author considers that although there is not likely to be any extension of the trade for the product as marketed at present, there is no reason why, with proper methods, good tea should not be produced in almost unlimited quantities.

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We record with great regret, as this number goes to the printers, the death of Mr. T. F. Cheeseman of New Zealand, on 15th October 1923. A notice of his contributions to botanical science will appear in the next number of the Bulletin.

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† Issued by the Ministry of Commerce, Bangkok, Price 1 tical.

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

## APPENDIX I.—1923.

## LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1922. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew.

## HERBACEOUS PLANTS.

Abronia umbellata.

Acaena argentea.
glaucophylla.
laevigata.
macrostemon.
Novae-Zealandiae.
ovalifolia.
ovina.
Sanguisorbae.
sericea.

Acantholimon glumaceum.
venustum.

Acanthus longifolius.
mollis.
Perringii.
Schottii.

Achillea ageratifolia.
argentea.
Clavennae.
conjuncta.

Achillea—*cont.*
Gerberi.
Huteri.
Kellereri.
lingulata.
macedonica.
macrophylla.
nana.
Portae.
pyrenaica.
sarracenica.
serbica.
sibirica.
spinulifolia.
tomentosa.
Wilczekii.

Aconitum barbatum.
Napellus.
— var. giganteum.
— var. tauricum.
orientale.
rostratum.
uncinatum.

x (78)19704 Wt 122—P 23 1000 12/22 E & S Item 7 A

Aconitum—*cont.*
volubile.
— var. tenuisectum.
Vulparia.

Actinomeris squarrosa.

Adenophora denticulata.
ornata.

Adonis aestivalis.
Walziana.

Aethionema amoenum.
cappadocicum.
iberideum.
Kotschyi.
pulchellum.

Agropyron acutum.

Agrostis alba.
elegans.

Alchemilla conjuncta.
Hoppeana.

Allium acuminatum.
albo-pilosum.
canadensis.
fistulosum.
giganteum.
grande.
Heldreichii.
Huteri.
hymenorrhizum.
karataviense.
macranthum.
montanum.
neapolitanum.
nigrum.
odorum.
Ostrowskianum.
pulchellum.
Purdomi.
roseum.
Schoenoprasum.
scorzonerifolium.
senescens.
siculum.

Allium—*cont.*
sikkimense.
sphaerocephalum.
tanguticum.
Tubergeni.

Alonsoa linifolia.

Alopecurus agrestis.
brachystachys.

Alstroemeria aurantiaca.
haemantha.
— var. rosea.
pelegrina var. alba.

Althaea ficifolia.
kurdica.
pallida.
rosea.
Sibthorpii.

Alyssum argenteum.
maritimum.
minimum.
montanum.
saxatile.
spinosum.

Amarantus caudatus.
chlorostachys.
hypochondriacus.
polygamus.
retroflexus.

Amellus annuus.

Amethystea caerulea.

Ammania japonica.

Ammi majus.

Ammobium alatum.

Ammophila arundinacea.

Anacyclus purpurascens.
Pyrethrum.

Anaphalis cinnamomea.

Anchusa capensis.
italica.
myosotidiflora.
sempervirens.

Androsace Chumbyi.
lactiflora.
lanuginosa.
spinulifera.

Anemone coronaria.
decapetala.
glaucifolia.
Halleri.
multifida.
pennsylvanica.
pratensis.
Pulsatilla.
rivularis.
sibirica.
sylvestris.

Angelica ampla.

Anoda Wrightii.

Anthemis montana.
— var. grandiflora.
tinctoria.
Triumfetti.

Anthericum Liliago.
— var. algeriense.

Antirrhinum Asarina.
glutinosum.
hispanicum.
Orontium.

Aplopappus croceus.

Aquilegia caerulea.
formosa.
glandulosa.
Skinneri.

Arabis alpina.
arenosa.
aubrietioides.
procurrens.
verna.

Arctotis stoechadifolia.

Arenaria austriaca.
balearica.
Bertolonii.
cephalotes.
glandulosa.
graminifolia.
gypsophiloides.
grandiflora.
juniperina.
Koriniana.
laricifolia.
montana.
pinifolia.
purpurascens.
sajanensis.
saxatilis.

Argemone alba.
hispida.
mexicana.
ochroleuca.

Armeria alpina.
canescens.
chilensis.
elongata.
latifolia.
majellensis.
plantaginea.
setacea.
Welwitschii.

Arnica Chamissonis.
longifolia.
montana.
sachalinensis.

Artemisia lactiflora.
parviflora.
pedemontana.
procera.
rupestris.
Siversiana.

Asperula azurea.
galioides.
tinctoria.

Asphodeline liburnica.
lutea.

Asphodelus albus.

Aster alpinus.
altaicus.
bellidifolius.
brachytrichus.
Curtisii.
Farreri
foliaceus.
Herveyi.
himalaicus.
laevis.
lichiangensis.
linariifolius.
Lipskyi.
Prescotii.
pyrenaeus.
sibiricus.
staticefolius.
subcaeruleus.
Vahlii.
vestitus.

Astilbe koreana.
rivularis.

Astragalus alopecuroides.
baeticus.
chlorostachys.
falcatus.
frigidus.
hamosus.
pentaglottis.
Siversianus.
stipulatus.
sukiensis.
sulcatus.
Zingeri.

Astrantia Biebersteinii.
helleborifolia.
major.

Athamanta Matthioli.

Atropa Belladonna.
— var. lutea.

Baeria coronaria.

Ballota Pseudo-dictamnus.

Baptisia australis.
— var. minor.

Beckmannia erucaeformis.

Bellium bellidioides.
minutum.

Berkheya Adlami.
purpurea.

Beta maritima.
trigyna.

Bidens ferulaefolia.
pilosa.

Biscutella auriculata.
didyma.

Biserrula Pelecinus.

Blumenbachia insignis.
muralis.

Brachyactis robusta.

Brachycome iberidifolia.

Brachypodium caespitosum.
pinnatum.
sylvaticum.

Brassica balearica.
Cheiranthos.
Erucastrum.
juncea.
monensis.
napus var. dichotoma.
oleracea.
rugosa.

Brickellia grandiflora.

Briza maxima.

Brodiaea lactea.
pedunculata.

Bromus breviaristatus.
brizaeformis.
ciliatus.
erectus.
japonicus.
macrostachys.
maximus.
purpureus.
rubens.
secalinus.
sterilis.
unioloides.

Browallia demissa.

Bulbine annua.

Bulbinella Hookeri.

Bupthalmum salicifolium.

Bupleurum falcatum.
longifolium.
rotundifolium.

Caccinia strigosa.

Cakile maritima.

Calamagrostis Epigeios.
lanceolata.
varia.

Calamintha alpina.
grandiflora.

Calandrinia grandiflora.

Calceolaria polyrrhiza.

Calla palustris.

Callistephus hortensis.

Camassia Cusickii.
Fraseri.
Leichtlinii.

Camelina foetida.
sativa.

Campanula barbata.
Erinus.
glomerata.
Grosseckii.
Imeretina.
kewensis.
lactiflora.
latifolia.
linifolia.
longistyla.
macrostyla.
Marchesettii.
patula.
persicifolia.
peregrina.
punctata.
rhomboidalis.
sarmatica.
versicolor.
Waldsteiniana.

Capsella grandiflora.
Heegeri.

Carbenia benedicta.

Carduus cernuus.
euosmus.
Kernerii.
nutans.
tenuiflorus.

Carex axillaris.
binervis.
laevigata.
pendula.

Carlina acanthifolia.
acaulis var. caulescens.

Carrichtera Vella.

Carthamus leucocaulos.
tinctorius.

Catananche coerulea.
— var. alba.

Cedronella triphylla.

Celmisia densiflora.
Lyallii.
Sinclairii.
spectabilis argentea.

Celsia glandulosa.

Centaurea axillaris.
Calcitrapa.
cynaroides.
dealbata.
depressa.
macrocephala.
montana.
moschata.
phrygia.
pulchra.
Rhaponticum.
rupestris.
ruthenica.
Sadleriana.

Centranthus macrosiphon.

Cephalaria alpina.
tatarica.
transylvanica.

Cerastium alpinum.
Biebersteinii.
grandiflorum.
macranthum.
tomentosum.

Cerinthe major.
retorta.

Chaerophyllum aromaticum.
aureum.
nodosum.
roseum.

Charieis heterophylla.

Chelidonium Franchetianum.

Chelone glabra.
obliqua.

Chenopodium amaranticolor.
ambrosioides.
Bonus-Henricus.
hybridum.
Nuttallii.
Quinoa.
urbicum.

Chorispora tenella.

Chrysanthemum anserinaefolium.
Aucherianum.
Balsamita.
carinatum.
caucasicum.
ceratophylloides.
cinerariaefolium.
coccineum.
coronarium.
corymbosum.
lacustre.
macrophyllum.
maximum.
myconis.
pallens.
rotundifolia.
viscosum.
Zawadskii.

Chrysopon Gryllus.

Cicer arietinum.
pinnatifidum.

Cicuta maculata.
virosa.

Cimicifuga cordifolia.
dahurica.
foetida.
racemosa.

Cladanthus proliferus.

Cladium mariscus.

Clarkia elegans.
pulchella.

Clematis Douglasii.
Fremonti.
recta.

Cleome violacea.

Cnicus arachnoideus.
diacantha.
eriophorus.
monspessulanus.
ochroleucus.
syriacus.

Codonopsis ovata.
sylvestris.

Coix Lacryma-Jobi.

Collinsia bicolor.
grandiflora.
violacea.

Collinsonia canadensis.

Collomia gilioides.
grandiflora.

Conringia orientalis.
perfoliata.

Convolvulus farinosus.
mauritanicus.
siculus.
undulatus.

Coreopsis auriculata.
coronata.
lanceolata.
rosea.
tinctoria.
verticillata.

Coriandrum sativum.

Corispermum hyssopifolium.

Corydalis capnoides.
racemosa.

Cortaderia argentea.
conspicua.

Cotyledon simplicifolia.

Cousinia Hystrix.

Crassula sarcocaulos.

Cremanthodium Forrestii
nobile.

Crepis blattarioides.
Dioscoridis.
rubra.
umbrella.

Crocus asturicus.
Imperati.
longiflorus.
medius.
speciosus.

Cuscuta Gronovii.

Cynara Scolymus.

Cynanchum japonicum.

Cynodon Dactylon.

Cynoglossum cheirifolium.
nervosum.
Wallichii.

Dactylis Aschersoniana

Dalea Alopecurus.

Danthonia calycina.

Datisca cannabina.

Datura inermis.
Tatula.

Delphinium atropurpureum.
Brunonianum.
caucasicum.
divaricatum.
elatum.
formosum.
grandiflorum.
nudicaule.
occidentale.
pictum.
speciosum.
vestitum.

Deschampsia caespitosa.
tenella.

Dianthus arenarius.
Armeria.
atrorubens.
caesius.
capitatus.
Carthusianorum.
Caryophyllus.
chinensis.
cruentus.
deltoides.
diffusus.
fragrans.
furcatus.
gallicus.
giganteus.
hirtus.
inodorus.
Knappii.
leptopetalus.
Lereschii.
monspessulanus.
Pancicii.
petraeus.
pubescens.
Requienii.
Seguieri.
sinensis.
subacaulis.
superbus.
Tenorei.
Waldsteinii.

Diarrhena americana.

Diascia Barbarae.

Dictamnus albus.
caucasicus.

Digitalis ambigua.
laevigata.
lutea.

Dimorphotheca aurantiaca.
hybrida.
pluvialis.

Dipcadi fulvum.
serotinum.

Diplachne fusca.

Dipsacus asper.
Fullonum.

Dodecatheon Lemoinei.
Meadia.
pauciflorum.

Draba Bertolonii.
hirta.
incana.
— var. Adamsii.
rupestris.

Dracocephalum austriacum.
Forrestii.
Isabellae.
Moldavica.
parviflorum.
Ruyschiana japonicum.

Dryas Drummondii.
octopetala.

Ecballium Elaterium.

Echinocystis lobata.

Eccremocarpus scaber.

Echinacea purpurea.

Echinaria capitata.

Echinops echinacea.

Elymus arenarius.
giganteus.
virginicus.

Emilia flammea.

Epilobium angustifolium.
Dodonaei.
rosmarinifolium.
sericeum.

Epipactis gigantea.
palustris.

Eragrostis abyssinica.
elegans.
maxima.

Eremostachys laciniata.

Eremurus himalaicus.
robustus.
— var. Elwesianus.

Erigeron bellidifolius.
canadensis.
glabellus.
glaucus.
leiomerus.
macranthus.
mucronatus.
multiradiatus.
philadelphicus.
salsuginosus.
uniflorus.

Erinus alpinus.

Eriophorum latifolium.

Eriophyllum caespitosum.

Eriogonum flavum.
racemosum.
subalpinum.
umbellatum.

Erodium Botrys.
daucoides.
gruinum.
hymenodes.
macradenum.
Manescavi.
petraeum.

Eryngium alpinum.
amethystinum.
Bourgatii.
bromeliaefolium.
giganteum.
maritimum.
palmatum.
planum.

Erysimum linifolium.
murale.
Perofskianum.
rupestre.

Eschscholzia caespitosa.
californica.
tenuifolia.

Eucharidium concinnum.

Eupatorium Fraseri.

Euphorbia graeca.
Lathyris.
maculata.

Farsetia clypeata.

Fedia Cornucopiae.

Ferula communis.
glauca.
syriaca.

Festuca alpina.
ampla.
Halleri.
ingrata.
Myuros.

Fragaria chiloensis.
indica.

Francoa ramosa.
sonchifolia.

Frankenia pulverulenta.

Fritillaria Souliei.

Funkia lancifolia.
ovata.
Sieboldiana.

Gaillardia aristata.
lanceolata.

Galega officinalis.
patula.

Galeopsis ochroleuca.

Gentiana asclepiadea.
— var. striata.
Cruciata.
dahurica.
decumbens.
Fetissowii.
Freyniana.
Grombezewskii.
Kesselringii.
lutea.
macrophylla.
septemfida.
straminea.
tibetica.
— var. major.
Waltoni.

Geranium albanum.
grandiflorum.
ibericum.
Londesii.
macrorrhizum.
rivulare.
sanguineum.
sylvaticum.
Wallichianum.

Gerbera Anandria.

Geum album.
bulgaricum.
chiloense.
Heldreichii.
intermedium.
montanum.
parviflorum.
pyrenaicum.

Gilia achilleaefolia.
aggregata.
androsacea.
capitata.
densiflora.
dianthoides.
liniflora.
multicaulis.
squarrosa.
tricolor.

Gillenia stipulacea.

Glaucium corniculatum.
flavum var. tricolor.

Globularia cordifolia.
vulgaris.

Glyceria maritima.
plicata.

Gomphrena globosa.

Grindelia integrifolia.
robusta.

Guizotia oleifera.

Gypsophila elegans.
Gmelinii.
paniculata.
prostrata.
Steveni.
viscosa.

Hablitzia tamnoides.

Halenia elliptica.

Hebenstreitia comosa.

Hedysarum coronarium.
esculentum.
elongatum.

Helenium Bolanderi.
nudiflorum.

Helianthella quinquenervis.

Helianthemum alpestre.
canum.
Tuberaria.

Helianthus mollis.
multiflorus.
Nuttallii.
tomentosa.

Heliopsis leavis.
scaber.

Helichrysum bracteatum.
saxatile.
Stoechas.

Helipterum Manglesii.
roseum.

Hemerocallis citrina.
flava.
Forrestii.
minor.
nana.

Hibiscus Trionum.

Hieracium aurantiacum.
amplexicaule.
Bornmülleri.
bupleuroides.
cappadocicum.
foliosum.
gymnocephalum.
Heldreichii.
Jankae.
lanatum.
maculatum.
pannosum.

Hieracium—*cont.*
tridentatum.
villosum.

Hilaria rigida.

Horminum pyrenaicum.

Hunnemannia fumariaefolia.

Hyacinthus azureus.
romanus.

Hymenophysa pubescens.

Hypecoum procumbens.

Hypericum Coris.
delphicum.
elodioides.
empetrifolium.
nummularium.
olympicum.
polyphyllum.
tomentosum.

Hypochaeris glabra.

Hysterionica pinifolia.

Iberis Amara.
Lagascana.
pinnata.
Tenoreana.
umbellata.

Incarvillea Delavayi.
lutea.

Inula brittanica.
ciliaris.
ensifolia.
Helenium.
hirta.
Hookeri.
racemosa.
salicina.
squarrosa.
thapsoides.

Iris arizonica.
bucharica.
chrysographis.
Cypriana.
Douglasiana.
foetidissima.
Guldenstaedtiana.
laevigata.
missouriensis.
ochroleuca.
tingitana.
versicolor.
Watsoniana.

Isatis glauca.
tinctoria.

Isopyrum fumarioides.

Iva xanthifolia.

Jasione perennis.

Juncus alpinus.
Chamissonis.
compressus.
Gerardii.
squarrosus.

Jurinia alata.

Kitaibelia vitifolia.

Kochia trichophila.

Koeleria albescens.
phleoides.
setacea.

Lactuca Bourgaei.
hastata.
macrophylla.
prenanthoides.

Lagurus ovatus.

Lallemantia canescens.
iberica.

Lamarckia aurea.

Laserpitium latifolium.
Siler.

Lasthenia glabrata.

Lathyrus angulatus.
Aphaca.
articulatus.
bithynica,
cirrhosus.
Clymenum.
filiformis.
latifolius.
maritimus.
montanus.
Nissolia.
Ochrus.
palustris.
pannonicus var. Smithii.
pisiformis.
rotundifolius.
sativus.
setifolius.
tingitanus.
undulatus.
variegatus.
venosus.

Lavatera cachemiriana.
thuringiaca.
trimestris.

Layia elegans.

Lens esculenta.

Leontopodium alpinum.

Lepachys pulcherrima.

Lepidium Draba.
Menziesii.

Leptosyne Douglasii.
maritima.

Levisticum officinale.

Ligusticum pyrenaicum.
Seguieri.

Lilium pardalinum.
pyrenaicum.

Limnanthes Douglasii.

Linaria dalmatica.
multipunctata.
purpurea.
repens.
saxatilis.
spartea.
triphylla.
tristis.

Lindelofia spectabilis.

Linum grandiflorum.
monogynum.
nervosum
perenne.
usitatissimum.

Loasa lateritia.
vulcanica.

Lobelia cardinalis.
sessiliflora.
syphilitica.

Lotus edulis.
Requienii.
Tetragonolobus.
uliginosus.

Lupinus Douglasii.
micranthus.
mutabilis.
nanus.
onustus.
subcarnosus.
sulphureus.
varius.

Luzula albida.
nivea.

Lychnis alpina.
chalcedonica.
Flos-jovis.
fulgens.

Lychnis—*cont.*
Githago.
Preslii.
Sartorii.
Viscaria.

Lycurus phleoides.

Lysichiton camtschaticum.

Lysimachia barystachys.
clethroides.
Ephemerum.
japonica.

Lythrum alatum.

Madia elegans.
sativa.

Malva Alcea.
Duriaei.
moschata.
parviflora.
rotundifolia.

Malvastrum lateritium.
limense.

Martynia proboscidea.

Matricaria Tchihatchewii.

Meconopsis cambrica.
integrifolia.
Prattii.

Medicago Echinus.
hispida var. pentacycla.
Murex.
orbicularis.
turbinata.

Melica altissima.
ciliata.

Melilotus alba.
indica.

Mentzelia Lindleyi.

Mesembryanthemum
crystallinum.
pomeridianum.

Meum athamanticum.

Microseris Lindleyi.

Mirabilis divaricata.
Jalapa.

Molinia caerulea.

Monarda fistulosa.

Monolepis trifida.

Morina longifolia.

Moscharia pinnatifida.

Muscari Argaei.
armeniacum.
comosum.
compactum.
Maweanum.
neglectum.
paradoxum.

Myosotis alpestris.

Myosurus minimus.

Myrrhis odorata.

Napaea dioica.

Narcissus Bulbocodium.
triandrus.

Nardus stricta.

Nemophila insignis.
maculata.
Menziesii.

Nepeta concolor.
discolor.
Mussinii.
nuda.

Nemesia versicolor.

Nicandra physaloides.

Nicotiana affinis.
rustica.
sylvestris.
Tabacum.

Nigella hispanica.
sativa.

Notobasis syriaca.

Nycterinia capensis.

Oenothera acaulis.
amoena.
fruticosa.
glauca.
lepida.
odorata.
pumila.
rosea.
triloba.

Omphalodes linifolia.

Ononis biflora.
natrix.

Onosma albo-roseum.

Orchis foliosa.
latifoliax maculata.
Munbyana.

Ornithopus sativus.

Origanum Majorana.

Ornithogalum arcuatum.

Ostrowskia magnifica.

Oxyria digyna.

Oxytropis argentea.
baicalensis.
strobilacea.

Paeonia lutea.
microcarpa.
peregrina.
villosa.

Panicum capillare.
miliaceum.
obtusum.
Teneriffae.

Papaver apulum.
Argemone.
commutatum.
hybridum.
laevigatum.
lateritium.
nudicaule.
orientale.
pavoninum.
pilosum.
rupifragum.
somniferum.

Paracaryum glochidiatum.

Patrinia gibbosa.
palmata.

Peganum Harmala.

Pennistum latifolium.
macrourum.

Pentstemon acuminatus.
barbatus.
confertus.
diffusus.
glaber.
glaucus.
humilis.
isophyllus.
laevigatus.
ovatus.
Palmeri.
Scouleri.
secundiflorus.
virgatus.

Perowskia atriplicifolia.

Petunia nyctaginiflora.

Peucedanum coriaceum.
graveolens.
officinalis.
Ostruthium.

Phacelia campanularia.
viscida.

Phaecasium pulchrum.

Phalaris tuberosa.

Phlomis agraria.
cashmiriana.
Herba Venti.
pratensis.
umbrosa.
viscosa.

Phuopsis stylosa.

Physochlaina orientalis.

Physostegia virginiana.

Phyteuma canescens.
orbiculare.
Scheuchzeri.
serratum.

Phytolacca acinosa.
decandra.

Picridium tingitanum.

Plantago Coronopus.
maritima.
Psyllium.
serpentina.

Platycodon grandiflorum.
— var. Mariesii.

Platystemon californicus.

Pleurospermum Golaka.

Plumbago micrantha.

Poa caesia.
violacea.

Podanthium Sibthorpii.

Podolepis acuminata.

Podophyllum Emodi.

Polemonium caeruleum.
filiferum.
foliosissimum.
pauciflorum.

Polygonum affine.
alpinum.
Laxmanni.
viviparum.
Weyrichii.

Polypogon monspeliensis.

Potentilla alba.
argentea.
argyrophylla.
canadensis.
caulescens.
chrysantha.
crinita.
dealbata.
Detomassii.
Fenzlii.
gracilis.
grandiflora.
Herbichii.
Hippiana.
hirta.
leuconota.
libanotica alba.
montenegrina.
multifida.
nepalensis.
nevadensis.
pennsylvanica.
recta.
rivalis.
rupestris.
sericea.
splendens.

Potentilla—*cont.*
tanacetifolia.
villosa.

Poterium alpinum.
canadense.
obtusum.

Preslia cervina.

Primula Agleniana.
Beesiana.
biserrata.
Coryana.
Edina.
Forrestii.
frondosa.
helodoxa.
Littoniana.
malacoides.
pseudo-sikkimensis.
secundiflora.
sikkimensis.
vittata.
Wardii.

Psoralea orbicularis.

Pycnanthemum lanceolatum.

Ramondia pyrenaica.

Ranunculus aconitifolius.
Flammula.
Gouanii.
lanuginosus.
millefoliatus.
muricatus.
nissanus.
platanifolius.
sceleratus.

Rehmannia angulata.
chinensis.

Reseda virgata.

Rheum Alexandrae.
palmatum.

Ricotia Lunaria.

Rodgersia aesculifolia.
pinnata.
podophylla.
sambucifolia.

Roemeria hybrida.

Romulea Bulbocodium.

Rudbeckia ampla.
amplexicaulis.
laciniata.
speciosa.

Rumex flexuosus.
hymenosepalus.
maritimus.
maximus.
salicifolius.
sanguineus.

Salpiglossis sinuata.

Salvia argentea.
candidissima.
cyanescens.
glutinosa.
Horminum.
japonica.
nemorosa.
Przewalskii.
Sclarea.
tiliaefolia.
uliginosa.
verticillata.
virgata.
viscosa.

Sambucus Ebulus.

Sanicula europaea.

Santolina pinnata.

Saponaria bellidifolia.
cerastioides.
ocymoides.
Vaccaria.
Wiemannii.

Saracha umbellata.

Satureja montana.
— var. illyrica.

Sauromatum guttatum.

Saussurea albescens.
pectinata.
salicifolia.

Saxifraga bronchialis.
calabrica.
catalaunica.
cartilaginea.
cochlearis.
— var. minor.
Cotyledon.
— var. pyrenaica.
cordifolia.
crassifolia.
crustata.
decipiens.
Delavayi.
exarata.
gemmipara.
Geum var. crenata.
— var. dentata.
granulata.
Haagei.
hederacea.
hirsuta.
Hostii.
lingulata.
— var. Albertii.
— var. lantoscana.
longifolia.
Macnabiana.
marginata.
nutans.
pedemontana.
rotundifolia.
Sibthorpii.
trifurcata.
Wallacei.

Scabiosa brachiata.
candicans.
caucasica.
Columbaria.

Scabiosa—*cont.*
crenata.
daucoides.
graminifolia.
Kitaibelii.
longifolia.
orientalis.
prolifera.
Pterocephala.
succisa.
sylvatica.
vestina.

Schizanthus pinnatus.

Sclerocarpus uniserialis.

Scolymus maculatus.

Scopolia sinensis.

Scorpiurus vermiculata.

Scorzonera hispanica.
rosea.

Scrophularia orientalis.

Securigera Coronilla.

Sedum altissimum.
Anacampseros.
anopetalum.
caeruleum.
elongatum.
Ewersii.
heterodontum.
hybridum.
kamtschaticum.
maximum.
Middendorfianum.
Nevii.
pilosum.
populifolium.
primuloides.
reflexum.
roseum.
Semenovii.
spathulifolium.
stoloniferum.
Woodwardii.

Selinum tenuifolium.
vaginatum.

Senecio adonidifolius.
alpinus.
clivorum.
Doria.
Doronicum.
elegans.
japonicus.
Ledebourii.
Ligularia.
Przewalskii.
squalidus.
stenocephalus.
suaveolens.
Veitchianus.
Wilsonianus.

Serratula coronata.
heterophylla.
quinquefolia.
tinctoria.

Seseli elatum.
gracile.
gummiferum.
osseum.
rigidum.

Sesleria argentea.

Setaria ambigua.
glauca.
italica.
verticillata.

Sida Napaea.

Sidalcea candida.
malvaeflora.
neo-mexicana.

Siderites scordioides.

Silene apestris.
Armeria.
Asterias.
colorata.
conica.

Silene—*cont.*
conoidea.
crassipes.
cretica.
echinata.
elegans.
Elizabethae.
fimbriata.
flavescens.
gallica.
italica.
laeta.
muscipula.
noctiflora.
nocturna.
nutans.
Otites.
paradoxa.
pendula.
quadrifida.
Reichenbachii.
Schafta.
squamigera.
vallesia.
viridiflora.
Zawadskii.

Siler trilobum.

Silphium Asteriscus.
laciniatum.
perfoliatum.
pinnatifidum.

Silybum eburneum.

Sium sisarum.

Smyrnium Olusatrum.
perfoliatum.

Spartina alterniflora.
stricta.

Specularia perfoliata.
Speculum.

Spenceria ramalana.

Sphaeralcea australis.

Spiraea Aruncus.
digitata.
palmata.

Stachys grandiflora.
lanata.
palustris.

Statice elata.
filicaulis.
sinensis.
sinuata.
Suwarowii.

Stevia ovata.

Stipa argentea.
papposa.

Swertia longifolia.
perennis.

Symphyandra Hofmannii.
pendula.
Wanneri.

Tagetes erecta.
patula.
signata.

Tellima grandiflora.

Tetragonia expansa.

Teucrium Botrys.
canadense.
Chamaedrys.
flavum.
lucidum.

Thalictrum aquilegifolium.
calabricum.
corynellum.
dipterocarpum.
Fendleri.
flavum.
glaucum.
minus.
Przewalskii.
squarrosum.

Thermopsis fabacea.
lanceolata.

Thymus odoratissimus.

Tragopogon orientalis.
porrifolius.

Trautvetteria palmata.

Tribulus terrestris.

Trifolium alpestre.
elegans.
ochroleucum.
pannonicum.
physodes.

Trigonella coerulea.
corniculata.
Foenum-graecum.
polycerata.

Trillium grandiflorum.
sessile.

Trollius sinensis.
yunnanensis.

Troximon laciniatum.

Tulipa Batalinii.
bifolia.
Kaufmanniana.
Sprengeri.

Tunica graminea.
prolifera.

Urospermum Dalechampii.

Ursinia pulchra.

Valerianella echinata.
eriocarpa.
vesicaria.

Veratrum californicum
nigrum.

Verbascum Chaixii.
longifolium.
nigrum var. album.
phoeniceum.
pyramidatum.

Verbena bonariensis.
paniculata.

Veronica Bidwillii.
Colensoi glauca.
exaltata.
fruticulosa.
gentianoides.
grandis.
incana.
incisa.
longifolia.
Lyallii.
morrisonicola.
multifida.
orientalis.
prostrata.
saxatilis.
spicata.
virginica.

Vesicaria grandiflora.

Vicia angustifolia.
calcarata.
fulgens.
grandiflora.
melanops.
pyrenaica.
striata.
unijuga.

Vincetoxicum fuscatum.

Viola canadensis.
epipsila.
Munbyana.
persicifolia.
suavis.
tricolor var. nigra.

Zauschneria californica.

Zephyranthes candida.

Zygadenus elegans.
venenosus.

# TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

*Abies balsamea.
*nobilis.

Acanthopanax divaricatum.
Giraldii.
lasiogyne.
sessiliflorum.
setchuenense.

Acer circinatum.
coriaceum.
grandidentatum.
Heldreichii.
—var. macropterum.
hyrcanum.
insigne.
japonicum var. microphyllum.
laetum.
Lobelii.
macrophyllum.
micranthum.
Miyabei
monspessulanum.
neglectum.
nikoense.
pennsylvanicum.
Trautvetteri.

Aegle sepiaria.

Aesculus indica.

Ailanthus glandulosa.

Akebia quinata.

Alnus cordifolia.
elliptica.
firma.
glutinosa.
incana.
japonica.
mollis.
nitida.
Alnus—*cont.*
oregona.
orientalis.
serrulata.
sitchensis.
tenuifolia.
viridis.

Amelanchier alnifolia.
asiatica.
canadensis.
florida.
vulgaris.

Aralia chinensis.
—var. glabrescens.

Arbutus Unedo.

*Arctostaphylos glauca.
Manzanita.
tomentosa.

Asimina triloba.

Baccharis patagonica.

Berberis aggregata.
angulosa.
aristata.
Beaniana.
brachypoda.
buxifolia.
canadensis.
Chitria.
concinna.
consimilis.
Darwinii.
diaphana.
dictyophylla.
Edgeworthiana.
Francisci-Ferdinandii.
Gagnepainii.
Guimpelii.
Hookeri.

Berberis—*cont.*
koreana.
Lycium.
nervosa.
orthobotrys.
polyantha.
Prattii.
sinensis.
Soulieana.
Stapfiana.
subcaulialata.
thibetica.
Thunbergii.
umbellata.
Veitchii.
Vernae.
virescens.
Wilsonae.

Betula allegheniensis.
coerulea.
corylifolia.
Ermanii.
— var. nipponica.
fruticosa.
humilis.
japonica var. mandshurica.
lenta.
lutea.
Medwediewii.
occidentalis.
papyrifera.
populifolia.
pumila.
utilis.
— var. Jacquemontii.

Bruckenthalia spiculifolia.

Buddleia albiflora.
alternifolia.
japonica.
nivea.
variabilis.
— var. Veitchiana.

Bupleurum fruticosum.

Buxus sempervirens.

Callicarpa Giraldiana.

Calophaca wolgarica.

Calycanthus floridus.
occidentalis.

Caragana ambigua.
arborescens.
aurantiaca.
Boisii.
decorticans.
frutescens.
microphylla.

Carmichaelia australis.
flagelliformis.

Carpinus caroliniana.
orientalis.
Turczaninowii.

Carya alba.

Cassandra calyculata.

*Cassia marylandica.

Cassinia fulvida.

Ceanothus integerrimus.
papillosus.
thyrsiflorus.

Cedrus atlantica.
Libani.

Celastrus articulatus.
scandens.

Celtis glabrata.
occidentalis.
Vilmoriniana.

Cephalotaxus drupacea.
Fortunei.
pedunculata.

Cercis Siliquastrum.

Chionanthus virginica.

Cistus canescens.
hirsutus.
laurifolius.
populifolius.
salvifolius.
villosus.

Cladrastis amurensis.

Clematis aethusifolia var.
latisecta.
akebioides.
connata.
— var. velutina.
Fargesii.
fusca.
integrifolia.
intermedia.
montana var. rubens.
orientalis.
Pitcheri.
Rehderiana.
Scottii.
Spooneri.
tangutica
Veitchiana.
virginiana.

Clerodendron Fargesii.
trichotomum.

Clethra acuminata.
alnifolia.
— var. paniculata.
monostachya.

Colutea bullata.
media.
orientalis.

Corema album.

Cornus alba.
Amomum.
asperifolia.
Baileyi.
Bretschneideri.
candidissima.
Cornus—*cont.*
controversa.
glabrata.
Kousa var. chinensis.
Mas.
Nuttallii.
officinalis.
paucinervis.
pubescens.
sanguinea.
stolonifera.

Corokia Cotoneaster.

Corylus americana.
chinensis.
Colurna.
heterophylla.

Cotoneaster acutifolia.
affinis.
amoena.
apiculata.
applanata.
bacillaris.
— var. obtusata.
bullata.
buxifolia.
divaricata.
Fontanesii.
Franchetii.
frigida.
— var. Vicarii.
Harroviana.
hebephylla.
Henryana.
horizontalis.
humifusa.
hupehensis.
integerrima.
laxiflora.
Lindleyi.
lucida.
microphylla.
moupinensis.
multiflora.
— var. calocarpa.
Nummularia.
obscura.
pannosa.

Cotoneaster—*cont.*
pekinensis.
prostrata.
rotundifolia.
salicifolia var. floccosa.
— var. rugosa.
Simonsii.
thymifolia.
uniflora.
Zabelii.

Crataegus acclivis.
altaica.
Arnoldiana.
asperifolia.
Azarolus.
basilica.
Beckwithae.
Boyntonii.
Buckleyi.
canadensis.
Carrierei.
Chapmanii.
coccinea.
coloradensis.
cordata.
densiflora
dilatata.
Dippeliana.
Downingii.
durobrivensis.
Egglestonii.
Ellwangeriana.
elongata.
Fisheri.
georgiana.
glandulosa.
grigoniensis.
Holmesiana.
infera.
intricata.
Jackii.
Jonesae.
Lambertiana.
leptophylla.
Macauleyi.
macracantha.
melanocarpa.
mollis.
neo-Canbyi.

Crataegus—*cont.*
orientalis.
pinnatifida.
praecox.
prunifolia.
pubescens var. stipulacea.
punctata.
semi-orbiculata.
sinaica.
succulenta.
tanacetifolia.
verecunda.
viridis.

*Cupressus arizonica.
Goveniana.
Lawsoniana.
macrocarpa.
nootkatensis.
thyoides.

Cydonia Maulei.

Cytisus biflorus.
capitatus.
monspessulanus.
nigricans.
purgans.
purpureus.
scoparius.
— var. Andreanus.
sessilifolius.

Daboëcia polifolia.

Daphne alpina.
Mezereum.

Daphniphyllum macropodum.

Davidia Vilmoriniana.

Decaisnea Fargesii.

Deutzia compacta.
corymbosa.
crenata.
gracilis.
longifolia.
— var. Veitchii.

Deutzia—*cont.*
macrocephala.
Sieboldiana.
Vilmoriniae.

Diervilla Lonicera.
rivularis.
sessilifolia.

Distylium racemosum.

Eccremocarpus scaber.

Elaeagnus angustifolia.
argentea.
multiflora.
pungens.
umbellata.

Eleutherococcus Henryi.
leucorrhizus.
— var. fulvescens.
scaberulus.
Simonii.

Erica ciliaris.
cinerea.
scoparia.
stricta.
Tetralix.

Euonymus Hamiltonianus.
japonicus.
latifolius.
oxyphyllus.
planipes.
ussuriensis.
yedoensis.

Eurotia ceratoides.

Evodia hupehensis.

Exochorda Albertii.
Giraldii.
grandiflora var. Wilsonii.

Fontanesia phillyraeoides.

Forsythia europaea.

Fraximus Ornus.
pennsylvanica.

Fremontia californica.

Garrya elliptica.

Gaultheria procumbens.
Shallon.

Gaylussacia dumosa.
resinosa.

Genista aethnensis.
pilosa.
radiata.
Spachiana.
tinctoria.
— var. elatior.
— var. mantica.
virgata.

Ginkgo biloba.

Halesia diptera.
hispida.
tetraptera.

Hamamelis arborea.
— var. Zuccariniana.
japonica.

Helianthemum alpestre.
polifolium.
vulgare.

Hibiscus syriacus.
— var. albus.
— var. azureus.
— var. Hamabo.

Hippophae rhamnoides.

Hydrangea.
Bretschneideri.
paniculata.
petiolaris.
radiata.
xanthoneura.
— var. glabrescens.

Hymenanthera crassifolia.

Hypericum Androsaemum.
aureum.
Buckleii.
elatum.
galioides.
hircinum.
Hookerianum.
inodorum.
Kalmianum.
patulum.
— var. Henryi.
perforatum.
prolificum.
uralum.

Ilex cornuta.
crenata.
decidua.
integra.
macrocarpa.
verticillata.

Indigofera Gerardiana.
Potatinii.

Jasminum Beesianum.
fruticans.
humile.

Juglans cathayensis.
cinerea.
nigra.

*Juniperus californica.
*communis.
*monosperma.
*Pinchotii.
*sabinoides.
*virginiana.

Kalmia cuneata.
latifolia.

Koelreuteria apiculata.
paniculata.

Laburnum alpinum.
vulgare.

Laurus nobilis.

Ledum latifolium.
palustre.

Leiophyllum buxifolium.

Leptospermum scoparium.

Leucothöe Davisiae.
racemosa.

Leycesteria formosa.

Ligustrum Delavayanum.
Ibota.
insulare.
macrocarpum.
Prattii.
Quihoui.
yunnanense.

Lonicera alpigena.
chaetocarpa.
chrysantha.
coerulescens.
deflexicalyx.
depressa.
dioica.
floribunda.
gynochlamydea.
Henryi.
involucrata.
— var. serotina.
Kesselringii.
Koehneana.
lanceolata.
Ledebourii.
longa.
Maackii.
micrantha.
Myrtillus.
obovata.
ovalis.
prostrata.
Ruprechtiana.
subequalis.
Sullivantii.
— var. hirsuta.
syringantha.

Lonicera—*cont.*
tatarica.
translucens.
trichopoda.
xerocalyx.

Lupinus arboreus.

Lycium chinense.

Lyonia ligustrina.

Magnolia acuminata.
Lennei.
parviflora.
Soulangeana.
tripetala.

Meliosma cuneifolia.

Menziesia globularis.

Microglossa albescens.

Myricaria germanica.

Myrtus communis.
Luma.

Neillia capitata.
opulifolia.
stellata.
Torreyi.

Nuttallia cerasiformis.

Olearia albida.
Haastii.
odorata.

Ononis fruticosa.

Osteomeles Schwerinae.
— var. microphylla.

Oxydendron arboreum.

Paeonia lutea.

Paliurus australis.

Pernettya mucronata.

Pertya sinensis.

Petteria ramentacea.

Phellodendron chinense.
sachalinense.

Philadelphus acuminatus.
brachybotrys.
californicus.
coronarius.
Falconeri.
Gordonianus.
incanus.
inodorus.
insignis.
latifolius.
Lewisii.
microphyllus.
pekinensis.
pubescens.
Satsumii.
sericanthus.
speciosissimus.
tomentosus.
Wilsonii.

Phillyraea angustifolia.
latifolia.

Photinia Beauverdiana.
— var. notabilis.
subumbellata.

Phyllodoce empetriformis.

Picea Breweriana.

Pieris formosa.
japonica.
mariana.

*Pinus Armandii.
*monticola.
*palustris.
parviflora.

Platanus acerifolia.
hispanica.
orientalis.

Potentilla fruticosa.
micrandra.

Prunus Avium.
emarginata.
incana.
incisa.
*insititia.
japonica.
*Lannesiana.
Maximowiczii.
serrulata.

Pseudolarix Fortunei.

Ptelea isophylla.
trifoliata.

Pterocarya Rehderiana.

Pyracantha angustifolia.
coccinea.
crenulata.
— var. Rogersiana.
Gibbsii.

Pyrus alnifolia.
americana.
— var. nana.
arbutifolia.
Aria var. majestica.
— var. salicifolia.
Aucuparia var. moravica.
Conradinae.
crataegifolia.
Folgneri.
glomerulata.
Hostii.
Matsumurana.
Meinichii.
minima.
nigra.
pekinensis.
pinnatifida.
pohuashanensis.
Prattii.

Pyrus—*cont.*
prunifolia.
Ringo.
rotundifolia.
Sargentii.
serotina var. Chojouri.
sikkimensis.
sorbifolia.
Sorbus.
theifera.
toringoides.
Torminalis.
trilobata.
Tschonoskii.
Vilmorinii.
Zumi.

Quercus castanaefolia.
coccifera.
Libani.
macranthera.
Mirbeckii.

Raphiolepis japonica.

Rhamnus californica.
— var. oleifolia.
cathartica.
davurica.
fallax.
Frangula.
infectoria.
japonica.
mandshurica.
Purshiana.
saxatilis.
tinctoria.

Rhododendron ambiguum.
Augustinii.
brachycarpum.
catawbiense.
concinnum.
Cuthbertii.
Davidsonianum.
decorum.
discolor.
ferrugineum.
halense.
Hanceanum.

Rhododendron—*cont.*
hippophaeoides.
impeditum.
lepidotum.
maximum.
Metternichii.
micranthum.
oleifolia.
oreotrephes.
racemosum.
rhombicum.
rubiginosum.
Vaseyi.
viscosum.
yanthinum
yunnanense.

Rhodotypos kerrioides.

Rhus glabra.
punjabensis.
vernicifera.

Ribes alpinum.
aureum.
cereum.
cruentum.
divaricatum.
futurum.
holosericeum.
mandshuricum.
mogollonicum.
robustum.
rotundifolium.
stenocarpum.
Warszewiczii.

Rosa alpina.
— var. pyrenaica.
baicalensis.
blanda.
coruscans.
cinnamonea.
Davidii.
— var. elongata.
elegantula.
Fendleri.
foliolosa.
glutinosa.
gymnocarpa.
Hugonis.
humilis.
involuta.
lucens.
Luciae.
macrophylla.
Malyi.
mollis.
Moyesii.
multibracteata.
nitida.
nutkana.
omeiensis.
— var. atrosanguinea
— var. polyphylla.
— var. pteracantha.
pisocarpa.
pomifera.
pratincola.
rubella.
rugosa.
Seraphinii.
sericea.
sertata.
setipoda.
Soulieana.
sprelta.
stylosa var. evanida.
Sweginzowii.
Webbiana.
Willmottiae.
Woodsii.

Rubus adenophorus.
biflorus var. quinqueflorus.
deliciosus.
flosculosus.
Giraldianus.
inopertus.
Kuntzeanus.
lasiostylus.
— var. dizygos.
mesogaeus.
nigro-baccus.
nutkanus.
odoratus.
parvifolius.
pubescens.
thibetanus.

Rubus—*cont.*
ulmifolius var. inermis.
xanthocarpus.

Ruscus aculeatus.
*racemosus.

Ruta graveolens.

Sarcococca ruscifolia.

Sciadopitys verticillata.

Securinega fluggeoides.
ramiflora.

Skimmia japonica.

Smilax hispida.
megalantha.

*Sophora Moorcroftiana.
viciifolia.

Spartium junceum.

Spiraea Aitchisonii.
arborea.
— var. glabrata.
betulifolia.
bracteata.
canescens.
discolor.
expansa.
japonica.
Lindleyi.
Nobleana.
salicifolia.
— var. stellipila.
tomentosa.
Veitchii.
Wilsonii.

Staphylea colchica.
pinnata.
trifolia.

Stranvaesia undulata.
salicifolia.

Styrax Hemsleyanum.
japonicum.
Wilsonii.

Symphoricarpus Heyeri.
mollis.
racemosus.

Syring Emodi.
reflexa.
villosa.
Wilsonii.

Tamarix pentandra.

Taxus cuspidata.

Thuya orientalis.

Vaccinium Arctostaphylos.
corymbosum.
hirsutum.
*macrocarpum.
pallidum.
Vitis-idaea.

Veronica carnea.
Colensoi.
macrocarpa.
Traversii.

Viburnum betulifolium.
Carlesii.
cotinifolium.
Henryi.
hupehense.
Lantana.
lobophyllum.
ovatifolium.
rhytidophyllum.
Sargentii.
Tinus.
tomentosum.
Veitchii.
venosum.

Vitis Coignetiae.
cordifolia.
heterophylla.
orientalis.

Vitis—*cont.*
vinifera.
vulpina.

Wistaria chinensis.
floribunda.
multijuga.

Zanthoxylum alatum.
Bungei.
piperitum.

*Zelkova sinica.

Zenobia speciosa.
— var. pulverulenta.

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ROYAL BOTANIC GARDENS, KEW.

# BULLETIN

OF

# MISCELLANEOUS INFORMATION.

APPENDIX II.—1923.

## LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in the Dominions, India and the Colonies, in Correspondence with Kew.

* Trained at Kew.

**Royal Botanic Gardens, Kew.—**

| | |
|---|---|
| Director | Arthur W. Hill, M.A., Sc.D., F.R.S., F.L.S. |
| Assistant Director | *Thomas Ford Chipp, M.C., B.Sc., Ph.D., F.L.S. |
| Assistant | *John Aikman. |
| ,, | *William Nicholls Winn. |
| Keeper of Herbarium and Library | Arthur Disbrowe Cotton, F.L.S. |
| Assistant | Charles Henry Wright, A.L.S. |
| ,, | *Sidney Alfred Skan. |
| ,, | Thomas Archibald Sprague, B.Sc., F.L.S. |
| ,, | Miss E. M. Wakefield, M.A., F.L.S. |
| ,, | *William Bertram Turrill, M.Sc. |
| ,, | *John Hutchinson, F.L.S. |
| ,, | K. W. Braid, B.A., B.Sc., A.I.C. |
| ,, | C. V. B. Marquand, M.A., F.L.S. |
| ,, for India | S. T. Dunn, B A. |
| ,, for West Africa | J. M. Dalziel, M.D., B.Sc., F.L.S. |
| ,, for South Africa | — |
| Artist | Gerald Atkinson. |
| Assistant Keeper, Jodrell Laboratory | Leonard Alfred Boodle, F.L.S. |
| Keeper of Museums | John Masters Hillier. |
| Assistant | *John H. Holland, F.L.S. |
| ,, | *William Dallimore. |
| Preparer | Laurance John Harding. |

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**Royal Botanic Gardens, Kew**—*continued.*

| | |
|---|---|
| Curator of the Gardens | *William J. Bean. |
| Assistant Curators:— | |
| Herbaceous Department | *Walter Irving. |
| Arboretum | *Arthur Osborn. |
| Greenhouse and Ornamental Department. | *John Coutts. |
| Tropical Department | *William Taylor. |
| Temperate House | *Charles P. Raffill. |

**Imperial Bureau of Mycology, Kew:—**

| | |
|---|---|
| Director | E. J. Butler, C.I.E, D.Sc., M.B., F.L.S. |

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**Aberdeen.**—Cruickshank Botanic Gardens:—

| | |
|---|---|
| Director and University Professor of Botany | W. G. Craib, M.A., F.R.S.E., F.L.S. |

**Cambridge.**—University Botanical Department:—

| | |
|---|---|
| Professor | A. C. Seward, M.A., F.R.S., F.L.S. |
| Director of Garden, and Curator, University Herbarium. | H. G. Carter, M.B., Ch.B. |
| Curator, University Museum. | H. H. Thomas, M.A. |
| Curator of Garden | *F. G. Preston. |

**Dublin.**—Royal Botanic Gardens, Glasnevin:—

| | |
|---|---|
| Acting Keeper | *J. W. Besant. |

Trinity College Botanic Gardens:—

| | |
|---|---|
| Professor | H. H. Dixon, Sc.D., F.R.S. |

**Edinburgh.**—Royal Botanic Garden:—

| | |
|---|---|
| Regius Keeper | W. Wright Smith, M.A., F.L.S., F.R.S.E. |
| Assistant to Regius Keeper. | —— |
| Assistant (Museum) | H. F. Tagg, F.L.S. |
| ,, (Herbarium) | W. E. Evans, B.Sc. |
| ,, (Laboratory) | M. Y. Orr. |
| ,, (Library) | J. T. Johnstone, M.A., B.Sc. |
| ,, (Studio) | R. M. Adam. |
| Head Gardener | *R. L. Harrow. |
| Assistant ,, | D. R. Oliver. |
| Plant Propagator | L. B. Stewart. |
| Foremen:— | |
| Arboretum | C. Lamont. |
| Glass Department | J. J. Campbell. |
| Herbaceous Department. | A. McCutcheon. |

**Glasgow.**—Botanic Gardens:—

| | |
|---|---|
| University Professor | F. O. Bower, M.A., Sc.D., F.R.S., F.L.S. |
| Director | E. Matthews. |

**London.**—Chelsea Physic Garden:—

| | |
|---|---|
| Curator - - - | *W. Hales, A.L.S. |

**Oxford.**—University Botanic Garden:—

| | |
|---|---|
| Professor - - - - | Sir F. W. Keeble, K.B.E., M.A., Sc.D., F.R.S., F.L.S. |
| Curator - - - - | *William G. Baker. |
| Curator, Fielding Herbarium. | G. C. Druce, M.A., F.L.S |

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## AFRICA.

**Union of South Africa.**—

Department of Agriculture:—
Division of Botany:—

**Pretoria.**—

| | |
|---|---|
| Chief of Division and Director, Botanical Survey - | I. B. Pole Evans, C.M.G., M.A., D.Sc., F.L.S. |
| Assistant Chief - - | Miss E. M. Doidge, M.A., D.Sc., F.L.S. |
| Botanist-in-Charge, National Herbarium. | E. P. Phillips, M.A., D.Sc., F.L.S. |
| Botanist - - - - | Miss J. D. Davidson, B.A. |
| Agrostologist - - - | Miss S. M. Stent. |
| Mycologist-in-Charge, Cryptogamic Herbarium | A. M. Bottomley, B.A. |
| Mycologist - - - | R. Davies, B.Sc. |
| Officer-in-Charge, Experiment Station - - | H. A. Melle, B.A. |
| Senior Field Officer - - | G. Hobson. |

**Cape Town.**—

| | |
|---|---|
| Mycologist - - | V. A. Putterill, M.A. |
| Botanist - - - | H. N. Howes, M.Sc. |

**Durban.**—

| | |
|---|---|
| Mycologist - | H. H. Storey, B.A. |

Department of Forests:—

| | |
|---|---|
| Chief Conservator - - | C. E. Legat, B.Sc. |

**Cape Province.**—

**Cape Town.**—National Botanic Garden:—

| | |
|---|---|
| Director - - - - | R. H. Compton, M.A. |
| Curator - - - - | *J. W. Mathews. |
| Gardener - - - - | *F. J. Cook. |

University of Cape Town:—

| | |
|---|---|
| Harry Bolus Professor of Botany - - - - | R. S. Adamson, M.A. |
| Harold Pearson Professor of Botany - - - - | R. H. Compton, M.A. |

South African Museum Herbarium:—

| | |
|---|---|
| Assistant-in-Charge - - | Miss S. Garabedian, B.A. |
| Curator, Bolus Herbarium - | Mrs. F. Bolus, B.A. |
| Assistant - - - - | N. S. Pillans. |

Municipal Gardens:—

| | |
|---|---|
| Curator - - - - | T. S. Dick. |

**Cape Province**—*continued.*

| | | |
|---|---|---|
| **Grahamstown.**—Albany Museum:— | | |
| | Superintendent of Herbarium. | S. Schönland, M.A., Ph.D. |
| | Garden and Public Parks:— | |
| | Curator - - | E. J. Alexander. |
| **Port Elizabeth** - | Superintendent - | John T. Butters. |
| **King Williamstown.** | Curator - - - | George Lockie. |
| **Graaff-Reinet** - | ,, - - - | *C. J. Howlett. |
| **Uitenhage** - | ,, - - - | H. Fairey. |

**Natal.**—

| | | |
|---|---|---|
| **Durban.**—Municipal Gardens:— | | |
| | Curator - - - | *H. Rutter. |
| **Pietermaritzburg.**—Botanic Garden:— | | |
| | Curator - - - | *H. H. Kidd. |

**Transvaal.**—

| | | |
|---|---|---|
| **Pretoria.**—Transvaal Museum:— | | |
| | Superintendent of Herbarium. | Mrs. R. Pott. |

**University of South Africa.**—

| | | |
|---|---|---|
| **Bloemfontein** | Professor of Botany - | G. Potts, M.Sc., Ph.D. |
| **Grahamstown** | ,, ,, - | S. Schönland, M.A., Ph.D. |
| **Johannesburg** | ,, ,, - | C. E. Moss, M.A., D.Sc., F.L.S. |
| **Pietermaritzburg.** | ,, ,, - | J. W. Bews, M.A., D.Sc. |
| **Pretoria** - | ,, ,, - | H. A. Wager, A.R.C.S. |

**University of Stellenbosch.**—

| | | |
|---|---|---|
| | Professor of Botany - | W. Nel, M.A. |
| | ,, ,, Phytopathology and Mycology. | P. van der Bijl, M.A., F.L.S. |

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**Egypt.**—

| | | |
|---|---|---|
| **Cairo.**—Ministry of Agriculture:— | | |
| | Inspector General - | A. T. McKillop. |
| | Botanical Section:— | |
| | Director - - - | E. Shearer, M.A., B.Sc. |
| | Botanist - - - | M. A. Bailey, B.A. |
| | ,, - - - | T. Trought, B.A. |
| | Mycologist - - - | H. R. Briton-Jones. |
| | Experimental Farms:— | |
| | Inspector - - - | M. W. Gray, M.A., B.Sc. |

**Gambia.**—Agricultural Department:—

| | |
|---|---|
| Director - - - | *A. J. Brooks, F.L.S., F.C.S. |

**Gold Coast.**—Agricultural Department:—

| | |
|---|---|
| Director - - - | W. S. D. Tudhope. |
| Deputy Director - | A. Ogilvie. |
| Assistant Director for Research and Mycologist. | R. H. Bunting, F.L.S. |
| Assistant Mycologist - | H. A. Dade. |
| Senior Superintendent | C. H. Knowles, B.Sc. |
| ,, ,, | *A. C. Miles. |

**Gold Coast**—*continued.*

| | | |
|---|---|---|
| Superintendents | - | - C. Saunders. |
| ,, | - | - *A. B. Culham. |
| ,, | - | - *T. Hunter. |
| ,, | - | - W. Caldwell. |
| Assistant Superintendents. | | *G. H. Eady. |
| ,, | ,, | M. D. Reece. |
| ,, | ,, | *W. C. Fishlock. |
| ,, | ,, | T. J. S. Smellie. |
| ,, | ,, | G. C. Coull, B.Sc. |
| ,, | ,, | J. Steele. |
| ,, | ,, | H. J. Horwood, B.A. |
| ,, | ,, | A. W. Paterson. |
| ,, | ,, | H. K. Hewison. |
| ,, | ,, | H. Nicholas. |
| Supervisor of Fruit and Vegetable Farms. | | A. A. L. Smith. |
| Conservator of Forests | - | L. A. King-Church. |

**Kenya Colony and Protectorate.—**

| | | |
|---|---|---|
| **Nairobi.**—Director of Agriculture | - | A. Holm. |
| Deputy Director of Agriculture. | | E. Harrison. |
| Mycologist | - - | J. McDonald, B.Sc. |
| Plant Breeder | - - | G. J. L. Burton. |
| Plant Import Inspector | | C. C. T. Sharpe. |
| Coffee Plant Inspector- | | A. D. Le Poer Trench. |
| Manager, Kabete Experimental Farm. | | J. Johnston. |
| Manager, Kibor Farm | | *F. B. Butler. |
| Experimentalist | - | *J. Sparrow. |
| Conservator of Forests | - | E. Battiscombe. |
| **Naivasha** - Manager of Experimental Farm. | | J. H. W. Beale. |

**Nigeria.**—Agricultural Department :—

| | | |
|---|---|---|
| Director of Agriculture | | O. T. Faulkner, B.A. |
| Assistant Director | - | P. H. Lamb, F.L.S. |
| Mycologist - | - - | T. Laycock. |
| ,, | | G. H. Jones, B.A. |
| Senior Botanist - | - | T. G. Mason, B.A. |
| Senior Superintendents | | *F. Evans, F.L.S. |
| ,, | ,, | A. J. Findlay, M.A., B.Sc. |
| ,, | ,, | K. T. Rae. |
| Superintendents | - | A. G. Beattie. |
| ,, | | *A. R. Bell. |
| ,, | | H. G. Burr, B.Sc. |
| ,, | | W. B. Dowson. |
| ,, | | S. M. Gilbert, B.Sc. |
| ,, | | F. D. Golding. |
| ,, | | J. E. Gray, B.A. |
| ,, | | J. O'N. Hewitt, A.R.C.S. |
| ,, | | A. G. G. Hill. |
| ,, | | C. J. Lewin, M.C. |
| ,, | | J. R. Mackie, B.Sc. |
| ,, | | R. F. Martin, B.Sc. |
| ,, | | R. Nichol. |
| ,, | | H. Roebuck. |
| ,, | | T. Thornton. |
| ,, | | H. B. Waters, B.A. |
| Director of Forests - | - - | H. N. Thompson, C.M.G. |

**Nyasaland Protectorate.—**

**Zomba.**—Agricultural and Forestry Department:—

| | |
|---|---|
| Director of Agriculture | E. J. Wortley, F.C.S. |
| Assistant Director - | *E. W. Davy. |
| Agriculturist - - | E. Grove-White. |
| ,, | F. Barker. |
| ,, | B. Browne. |
| Chief Forest Officer - | *J. M. Purves. |

**Rhodesia.—**

**Bulawayo.**—Rhodes Matopos Park:—

| | |
|---|---|
| Curator - - - | W. E. Dowsett. |

**Salisbury.**—Department of Agriculture:—

| | |
|---|---|
| Director - - - | E. A. Nobbs, Ph.D., B.Sc. |
| Agriculturist and Botanist. | H. G. Mundy, F.L.S. |
| Assistant ,, - | J. A. T. Walters, B.A. |
| ,, ,, | C. Mainwaring. |
| Forest Officer - - - | J. S. Henkel. |

**Sierra Leone.—**

| | |
|---|---|
| Commissioner of Lands and Forests. | *M. T. Dawe, F.L.S. |

Agricultural Department:—

| | |
|---|---|
| Director of Agriculture | D. W. Scotland. |
| Assistant Director - | —— |
| Assistant - - - | J. W. D. Fisher. |
| Conservator of Forests - | —— |

**Soudan.—**

| | | |
|---|---|---|
| **Khartoum** - | Director of Agriculture and Forests. | E. B. Wilkinson. |
| | Government Botanist | R. E. Massey, F.L.S. |
| | Superintendent of Palace Gardens. | *F. S. Sillitoe. |
| **Jebelin** - - | Superintendent of Experimental Plantations. | *T. Cartwright. |

**Tanganyika Territory.—**

| | |
|---|---|
| Director of Agriculture | A. H. Kirby, B.A. |
| Deputy Director of Agriculture. | H. Wolfe, M.Sc. |
| Senior District Agricultural Officer. | D. Prain. |
| District Agricultural Officer. | E. Brand. |
| ,, ,, | A. E. Haarer. |
| ,, ,, | R. J. Lathbury, B.Sc. |
| ,, ,, | A. Pitcairn. |
| ,, ,, | O. E. Whitehead. |
| ,, ,, | L. C. Edwards. |
| Plant Import Inspector | A. R. Hildebrand. |
| Head Gardener, Dar-es-Salaam. | *T. H. Marshall. |
| Director of Amani Institute. | A. Leeclman, M.A., F.L.S. |
| Assistant Director of Amani Institute. | —— |
| Curator, Amani Institute. | *F. M. Rogers. |
| Conservator of Forests - | D. K. S. Grant. |

**Uganda Protectorate.—**

**Kampala.**—Agricultural Department:—

| | |
|---|---|
| Director of Agriculture | S. Simpson, B.Sc. |
| Deputy Director of Agriculture. | L. Hewett. |
| Mycologist. | W. Small, M.B.E., M.A., B.Sc., Ph.D. |
| Botanist - - - | *T. D. Maitland. |
| District Agricultural Officer. | *J. D. Snowden. |
| ,, ,, | R. T. Wickham. |
| ,, ,, | E. G. Staples. |
| Assistant Agricultural Officer. | *C. Hazel. |
| ,, ,, | *P. Chandler. |
| ,, ,, | *F. W. Hall. |
| ,, ,, | *G. T. Philpott. |
| ,, ,, | J. S. Harmsworth, M.C. |
| ,, ,, | *E. A. Ruck. |

**Entebbe.**—Botanical, Forestry & Scientific Department:—

| | |
|---|---|
| Chief Forestry Officer | *Robert Eyffe. |

**Zanzibar.**—

| | |
|---|---|
| Director of Agriculture - | V. H. Kirkham. |
| Assistant Director - | Robert Armstrong. |
| Mycologist - - - | Miss E. J. Welsford, M.B.E., F.L.S. |
| Inspector of Plantations. | G. Tomson. |

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## AUSTRALIA.

**New South Wales.**—Botanic Gardens:—

| | |
|---|---|
| **Sydney-** - Director and Government Botanist. | J. H. Maiden, I.S.O., F.R.S., F.L.S |
| Superintendent - - | E. N. Ward. |
| Botanical Assistant - | E. Cheel. |
| ,, ,, | W. F. Blakeley. |
| ,, ,, | R. H. Anderson, B.Sc. |
| University Professor of Botany. | A. Anstruther Lawson, D.Sc., Ph.D., F.L.S. |
| **Technological Museum:—** | |
| Curator - - - | G. Hooper. |
| Economic Botanist - | M. B. Welch, B.Sc. |
| Chief Commissioner of Forests. | R. D. Hay. |

**Queensland.—**

**Brisbane.**—Botanic Gardens:—

| | |
|---|---|
| Government Botanist - | C. T. White, F.L.S. |
| Curator - - - | E. W. Bick. |
| Conservator of Forests - | E. H. F. Swain. |

**Lawnton.**—Acclimatisation Society's Gardens:—

| | |
|---|---|
| Manager - - - | R. W. Peters. |

**Rockhampton.**—Municipal Garden:—

| | |
|---|---|
| Superintendent - - | R. Simmons. |

**South Australia.—**

**Adelaide.**—University Professor of Botany. — T. G. B. Osborn, D.Sc.

Botanic Gardens:—

Director - - - J. F. Bailey.

Woods and Forests:—

Conservator - - Walter Gill, F.L.S.

**New Guinea.—**

**Rabaul.**—Department of Agriculture:

Director of Agriculture - G. Bryce, M.A., B.Sc.

Botanic Gardens:—

Acting Superintendent - R. A. Hopkins.

**Northern Territory.—**

**Port Darwin** - Superintendent of Agriculture and Curator, Botanic Gardens - *C. E. F. Allen.

**Tasmania.—**

**Hobart** - - Government Botanist — Leonard Rodway, C.M.G.

Conservator of Forests — L. G. Irby.

Botanic Gardens:—

Superintendent - - J. Wardman.

**Victoria.—**

**Melbourne.**—Botanic Gardens:—

Curator - - - J. Cronin.

National Herbarium (South Yarra):—

Government Botanist - W. Laidlaw, B.Sc.

Assistant - - - J. R. Tovey.

,, J. W. Audas.

,, P. F. Morris.

University Professor of Botany. — A. J. Ewart, D.Sc., Ph.D., F.L.S

Chief Commissioner of Forests. — Owen Jones, B.A.

**Western Australia.—**

**Perth** - - Botanist and Pathologist. — ——

Acting Conservator of Forests. — S. Kessell, B.Sc.

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## BERMUDA.

Agricultural Department:—

Director - - - E. A. McCallan.

Plant Pathologist - L. Ogilvie, M.A., B.Sc.

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## CANADA.

**Ottawa** - - Director of Government Experimental Farms. — J. H. Grisdale.

Dominion Horticulturist. — W. T. Macoun.

Dominion Botanist - H. T. Güssow.

**Ottawa**—*continued.*

| | |
|---|---|
| Assistant - - - | J. Adams. |
| ,, - - - | R. A. Inglis. |
| Plant Pathologist - | F. L. Drayton. |
| ,, ,, (Forests) | A. W. McCallum. |
| National Herbarium, Victoria Memorial Museum:— | |
| Chief Botanist - - | M. O. Malte. |
| Assistant - - | Miss M. Stewart. |

## CEYLON.

**Peradeniya.**—Department of Agriculture:—

| | |
|---|---|
| Director of Agriculture - | F. A. Stockdale, M.A., F.L.S. |
| Botanist and Mycologist | T. Petch,, B.A., B.Sc. |
| Economic Botanist - | R. O. Iliffe, B.A. |
| Assistant Botanist and Mycologist. | —— |
| Assistant Mycologist - - | C. H. Gadd, B.Sc. |
| Manager, Peradeniya Experiment Station. | T. H. Holland. |
| Superintendent of Botanic Gardens. | *H. F. Macmillan, F.L.S. |
| Curator of Royal Botanic Gardens, Peradeniya. | *T. H. Parsons. |
| Curator, Hakgala Gardens | *J. J. Nock. |
| Divisional Agricultural Officer. | G. G. Auchinleck, M.Sc., A.I.C., F.C.S. |
| ,, ,, | G. Harbord. |
| ,, ,, | N. Marshall, B.Sc. |
| ,, ,, | F. Burnett, M.C., B.Agr. |
| Plant Diseases Inspector (Mycological). | N. K. Jardine. |
| Conservator of Forests - - | J. D. Sargent. |

## CYPRUS.

| | |
|---|---|
| Principal Forest Officer - | A. H. Unwin, D.Oec. |
| Director of Agriculture - | W. Bevan. |

## FALKLAND ISLANDS.

Government House Garden:—

| | |
|---|---|
| Head Gardener - - - - | —— |
| Forest Officer - - - - | James Reid. |

## FIJI.

| | |
|---|---|
| Superintendent of Agriculture and Curator, Suva Botanic Gardens (Temporary). | G. M KcKeown. |

## HONG KONG.

Botanic and Forestry Department:—

| | |
|---|---|
| Superintendent - - - | *H. Green. |
| Assistant Superintendent - - | —— |

## MALAY PENINSULA.

**Straits Settlements.**—Botanic Gardens :—

| | | |
|---|---|---|
| **Singapore** - | Director - - - | I. H. Burkill, M.A. F.L.S. |
| | Assistant Director | - R. E. Holttum, B.A. |
| | Assistant Curator | - *G. A. Best. |
| | ,, ,, | J. Lennon. |
| **Penang**- - | Assistant Curator | - *F. Flippance. |

**Federated Malay States.**—Forest Department :—

| | |
|---|---|
| Conservator - - | G. E. S. Cubitt. |
| Forest Research Officer | F. Foxworthy, Ph.D. |

**Kuala Lumpur.**—Agricultural Department, F.M.S. and S.S. :—

| | |
|---|---|
| Secretary for Agriculture - - - | A. S. Haynes. |
| Assistant to Secretary | F. de la M. Norris, B.Sc. |
| Mycologist - - - | A. Sharples. |
| Assistant Mycologist - | F. R. Mason. |
| ,, ,, | A. Thompson, B.Sc. |
| Systematic Botanist - | M. R. Henderson, B.Sc. |
| Economic Botanist - | H. W. Jack, B.A., B.Sc. |
| Assistant Economic Botanist. | *W. N. Sands, F.L.S. |
| Physiologist - - | W. N. C. Belgrave, B.A |
| Agriculturist - - | F. G. Spring, F.L S. |
| ,, - - | B. Bunting. |
| Assistant Agriculturist - | *J. N. Milsum, F.L.S. |
| ,, ,, | E. Farquharson. |
| ,, ,, | T. D. Marsh. |
| ,, ,, | E. A. Curtler, B.A. |
| Superintendent of Government Plantations | *J. Lambourne. |
| Chief Agricultural Inspector. | F. W. South, M.A. |
| Assistant Agricultural Inspector. | *F. Birkinshaw. |
| ,, ,, | A. E. Doscas. |
| ,, ,, | A. A. Campbell, B.Sc. |
| ,, ,, | J. Fairweather. |
| ,, ,, | G. E. Mann, B.A. |
| ,, ,, | J. L. Minto. |
| ,, ,, | T. C. Nock. |
| ,, ,, | S. D. Timson. |
| Agricultural Instructor | D. H. Grist. |
| ,, ,, | J. M. Howlett, B.A. |

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## MALTA.

Superintendent of Agriculture - J. Borg, M.A., M.D.

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## MAURITIUS.

**Reduit.**—Department of Agriculture :—

| | |
|---|---|
| Director - - - - | Hon. H. A. Tempany, D.Sc., F.I.C., F.C.S. |

**Reduit**—*continued.*

| | | |
|---|---|---|
| Assistant Director | - - | P. R Dupont. |
| ,, ,, | - - | D. d'Emmerez de Charmoy. |
| Botanist and Mycologist | - | E. F. L. Shepherd. |
| Agricultural Superintendent | | *A. S. Clegg. |
| Agricultural Instructor | - | J. W. Shand Harvey. |

**Rodriguez.**—Assistant Superintendent *G. Corbett.

**Port Louis.**—Department of Forests:—

Director - - - - Paul Koenig.

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## NEW ZEALAND.

| | | |
|---|---|---|
| **Dunedin** - - | Superintendent - - | *D. Tannock. |
| **Napier** - - | ,, - - | W. Barton. |
| **Auckland** - - | Ranger - - - - | William Goldie. |
| **Christchurch** - | Head Gardener - - | J. Young. |

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## SEYCHELLES.

Department of Agriculture:—

Director - - - F. S. Lyne.

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## TONGA ISLANDS.

Director of Agriculture C. E. Wood.

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## WEST INDIES.

**Imperial College of Tropical Agriculture:—**

| | | |
|---|---|---|
| **Trinidad.**—Principal and Commissioner, Imperial Dept. of Agriculture. | | Sir Francis Watts, K.C.M.G., D.Sc., F.I.C., F.C.S. |
| | Professor of Botany - | S. C. Harland, D.Sc., F.L.S. |
| | ,, Mycology | F. Ashby, B.Sc. |

**Leeward Islands:—**

**Federal (Antigua).**—Department of Agriculture:—

| | |
|---|---|
| Government Chemist and Superintendent of Agriculture. | A. E. Collens, F.I.C., F.C S. |

**Antigua.**—Botanic Station:—

| | |
|---|---|
| Agricultural Superintendent. | *F. G. Harcourt. |
| Agricultural Instructor | E. S. Eldridge. |
| Assistant - - - | A. C. Thompson. |

**Dominica.**—Botanic Station:—

| | |
|---|---|
| Curator - - - | *Hon. Joseph Jones. |
| Assistant Curator and Assistant Chemist. | —— |

**Montserrat.**—Botanic Station:—

| | |
|---|---|
| Curator - - - | *W. Robson. |
| Assistant Curator - - | A. W Gallwey. |

**St. Kitts-Nevis.**—Botanic Station:—

| | |
|---|---|
| Agricultural Superintendent. | F. R. Shepherd. |
| Assistant Superintendent | —— |
| Agricultural Instructor, Nevis. | W. I. Howell. |

**Virgin Islands.**—Botanic Station:—

| | |
|---|---|
| Curator - - - | C. A. Gomez. |

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**Windward Islands:—**

**Grenada.**—Botanic Garden:—

| | |
|---|---|
| Agricultural Superintendent (Acting). | W. O. Donovan. |
| Agricultural Instructor - | E. L. Cherubim. |

**St. Lucia.**—Botanic Station:—

| | |
|---|---|
| Agricultural Superintendent. | *E. A. Walters. |
| Agricultural Assistant - | —— |

**St. Vincent.**—Botanic Station:—

| | |
|---|---|
| Agricultural Superintendent. | *T. Jackson. |
| Assistant Agricultural Superintendent. | —— |

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**Barbados.**—Department of Agriculture:—

| | |
|---|---|
| Director - - - | J. R. Bovell, I.S.O., F.C.S. |
| Assistant Director | B. A. Bourne, B.Sc. |

**British Guiana.**—Department of Science and Agriculture:—

| | | |
|---|---|---|
| **Georgetown** - | Director - - - | Sir J. B. Harrison. C.M.G., M.A., F.I.C., F.C.S., F.G.S. |
| | Assistant Director - | W. Francis. |
| | Assistant Botanist and Mycologist - | R. A. Altson. |
| | Horticultural Superintendent. | A. A. Abraham (Acting). |
| | Superintendent of Botanic Gardens and Agricultural Stations. | *Robert Ward. |
| | Superintendent of Sugar Experiment Stations. | J. Crabtree. |
| | Forestry Officer - - - | L. S. Hohenkerk. |

**British Honduras.**—Botanic Station:—

| | |
|---|---|
| Curator - - - | —— |
| Forestry Officer - - - | C. Hummel. |

**Jamaica** - - Director - - - Hon. H. H. Cousins, M.A., F.C.S.

Assistant Director and Government Botanist —

Microbiologist - - C. G. Hansford.

Travelling Instructor - *William Cradwick.

,, ,, James Briscoe.

Public Gardens and Plantations:—

Assistant Superintendent - *E. Downes.

Farm Superintendent - R. S. Martinez.

**Tobago.**—Botanic Station:—

Curator - - - R. J. Link.

**Trinidad.**—Department of Agriculture:—

Director - - - W. G. Freeman, B.Sc., A.R.C.S., F.L.S.

Assistant Director - W. Nowell, B.A., B.Sc.

Economic Botanist - *A. G. Bailey, B.A.

Mycologist - - - F. Stell.

Curator, Royal Botanic Gardens. *R. O. Williams.

Conservator of Forests - C. S. Rogers.

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## INDIA.

**Botanical Survey of India:—**

Director - - - - - Lt.-Col. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Economic Botanist - - - —

Assistant for Phanerogamic Botany P. M. Debburman, B.Sc.

,, ,, ,, N. Naryanswami, M.A.

**Imperial Forest Research Institute (Dehra Dun, U.P.):—**

Imperial Forest Botanist - R. S. Hole, C.I.E., F.L.S.

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**Departments of Agriculture,** Botanical Officers attached to:—

**Imperial Agricultural Research Institute, Pusa, Bengal:—**

Imperial Mycologist - - W. McRae, M.A., B.Sc., F.L.S.

Second Imperial Mycologist F. J. F. Shaw, D.Sc., F.L.S.

Supernumerary Mycologist - J. F. Dastur, M.Sc.

Imperial Economic Botanist —

**Bengal Agricultural Department, Dacca:—**

Economic Botanist - - G. P. Hector, M.A., B.Sc.

**Bihar and Orissa Agricultural Department, Sabour:—**

Economic Botanist - - —

**Bombay Agricultural Department, Poona:—**

Economic Botanist - - W. Burns, D.Sc.

**Departments of Agriculture,** Botanical Officers attached to—*continued.*

**Central Provinces Agricultural Department, Nagpur :—**

| | | |
|---|---|---|
| Economic Botanist | - | —— |

**Madras Agricultural Department, Coimbatore :—**

| | | |
|---|---|---|
| Government Sugarcane Expert. | | —— |
| Government Economic Botanist. | | F. R. Parnell. |
| ,, ,, | (for Cotton) | G. R. Hilson, B.Sc. |
| Government Lecturing Botanist. | | K. Rangachari, M.A. |
| Government Mycologist | | —— |

**Punjab Agricultural Department, Lyallpur :—**

| | | |
|---|---|---|
| Economic Botanist | - | D. Milne, B.Sc. |

**United Provinces Agricultural Department, Cawnpur :—**

| | | |
|---|---|---|
| Director of Agriculture (Lucknow). | | H. M. Leake, M.A., D.Sc., F.L.S. |
| Deputy Director (Garden Circle) | - | *A. E. P. Griessen. |
| Economic Botanist | - | W. Youngman, B.Sc. |
| Plant Pathologist | - | P. K. Dey. |

**North-West Frontier Province :—**

| | | |
|---|---|---|
| Agricultural Officer | - | *W. R. Brown. |

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## BENGAL.

**Calcutta.**—Royal Botanic Garden, Sibpur :—

| | | |
|---|---|---|
| Superintendent | - - | Lt.-Col. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S. |
| Curator of Herbarium | - | C C. Calder, B.Sc., F.L.S. |
| Curator of Garden | - | *W. V. North. |
| 1st Overseer | - - | N. Mitra. |
| 2nd Overseer | - - | M. Jones. |
| Probationer | - - | —— |

Gardens in Calcutta :—

| | | |
|---|---|---|
| Assistant Curator | - | *P. V. Osborne. |
| Overseer - - | - | S. N. Bose. |

Agri-Horticultural Society of India :—

| | | |
|---|---|---|
| Secretary - - | - | S. P. Lancaster, F.L.S. |

**Darjeeling.**—Lloyd Botanic Garden :—

| | | |
|---|---|---|
| Superintendent | - - | Lt.-Col. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S. |
| Curator - - | - | *G. H. Cave. |

**Cinchona Department.**—

| | | |
|---|---|---|
| Superintendent of Cinchona Cultivation. | | Lt.-Col. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S. |

**Cinchona Department**—*continued.*

**Mungpoo Plantation**:—

| | |
|---|---|
| Manager - - | - *P. T. Russell. |
| 1st Overseer - | - P. Cresswell. |
| 2nd Overseer - | - James Hulbert. |

**Munsong Plantation**:—

| | |
|---|---|
| Manager - - | - *H. F. Green. |
| Assistant Manager | - *H. Thomas. |
| Overseer - - | - G. Holl. |

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## BOMBAY.

**Bombay City.**—Municipal Garden:—

| | |
|---|---|
| Superintendent - | - J. M. Doctor. |

**Ghorpuri.**—Botanic Garden:—

| | |
|---|---|
| Superintendent - | - P. G. Kanetkar. |

**Poona.**—Government Gardens:—

| | |
|---|---|
| Superintendent - | - *E. Little. |

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## BURMA.

**Rangoon.**—Agri-Horticultural Society:—

| | |
|---|---|
| Superintendent - | - R. E. Cooper. |

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## CENTRAL PROVINCES.

**Nagpur.**—Public Gardens:—

| | |
|---|---|
| Superintendent - | - *J. E. Leslie. |

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## MADRAS.

**Madras City.**—Agri-Horticultural Society:—

| | |
|---|---|
| Superintendent - | - H. E. Houghton, F.L.S. |

**Ootacamund.**—Government Gardens and Parks:—

| | |
|---|---|
| Curator - - | - *F. H. Butcher. |

**Cinchona Department.**—

| | |
|---|---|
| Deputy Director of Agriculture (Cinchona) | A. Wilson, B.Sc. |
| Superintendent, Doda-betta Plantation. | H. V. Ryan. |
| Superintendent, Nedivattam and Hooker Plantations. | E. Collins. |

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## PUNJAB.

**Delhi.**—Historic and other Gardens:—

| | |
|---|---|
| Superintendent - | - *R. H. Locke. |

**Lahore.**—Government Gardens :—

Superintendent - - *A. Hardie

Lawrence Gardens :—

Superintendent - - *W. R. Mustoe.

**Simla.**—Vice-regal Estate Gardens :—

Superintendent - - *Ernest Long.

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## UNITED PROVINCES OF AGRA AND OUDH.

Gardens administered by Dept. of Agriculture :—

**Agra.**—Taj and other Gardens :—

Superintendent - - *W. Head

**Allahabad.**—Government Gardens :—

Officiating Superintendent - - - R. D. Fordham.

**Fyzabad.**—Government Gardens :—

Officiating Superintendent - - J. G. Burns.

**Kumaon.**—Government Gardens :—

Superintendent - - *Norman Gill, F.L.S.
Overseer - - - W. S. Smith, M.C.

**Lucknow.**—Horticultural Gardens :—

Officiating Superintendent - - - F. H. Johnson.
Overseer - - - V. E. Morgan.

**Saharanpur.**—Government Botanic Gardens :—

Superintendent - - *R. Badgery.

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## ASSAM.

**Shillong.**—Government Gardens :—

Curator - - - *L. F. Ruse.

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## NATIVE STATES.

**Indore :—**

Economic Botanist - A. Howard, C.I.E., M.A., F.L.S.

**Mysore (Bangalore) :—**

Economic Botanist - *G. H. Krumbiegel.

**Baroda :—**

Superintendent - - T. R. Kothawala.

**Travancore (Trivandrum) :—**

Director - - - Major F. W. Dawson.

**Udaipur :—**

Superintendent - - T. H. Storey.

**Gwalior :—**

Director, State Gardens *B. F. Cavanagh.